Methamphetamine: Brain and Behavior: Research Findings

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"Fire" is slang for Methamphetamine

Methamphetamines
A Brief History

- **1887** **Amphetamine developed**
- **1919** **Methamphetamine developed**
- **1932** **Amphetamine & methamphetamine used as decongestant**

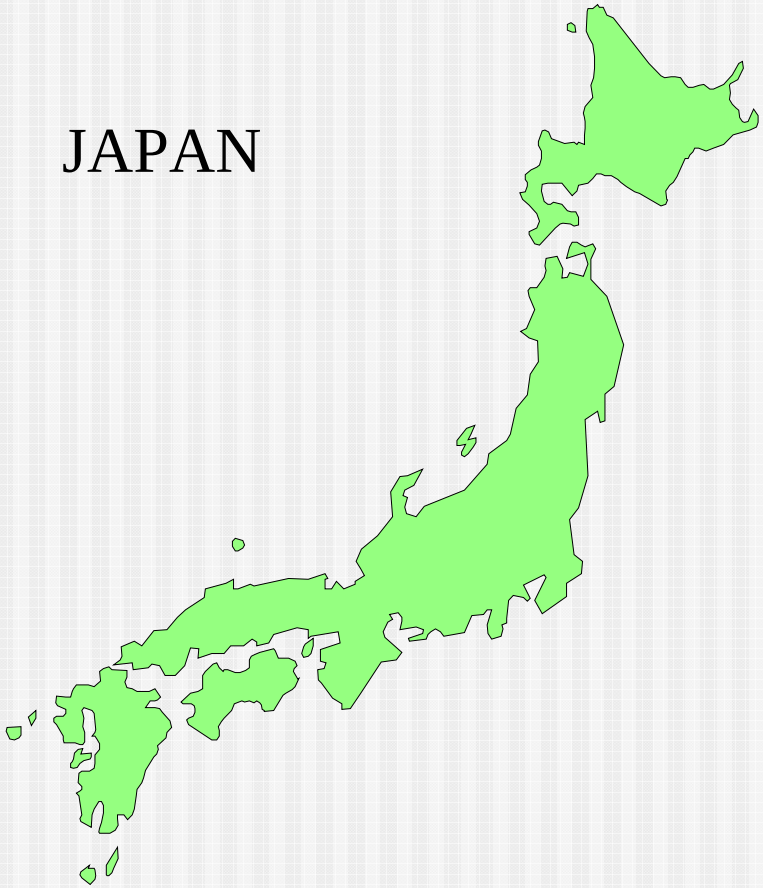
Methamphetamines
A Brief History

- **WW II**

Extensive use by:

- **RAF fighter pilots**
- **German Panzer troops**
- **Japanese workers**
- **Led to Kamikaze fever**

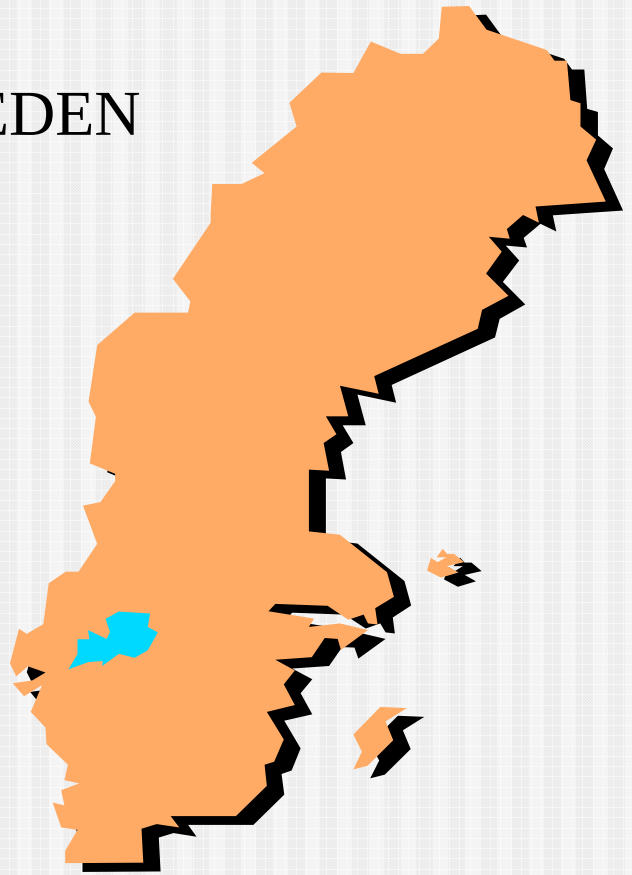
Methamphetamines
A Post-War Epidemic



- **FACTORS**
- **Large quantities**
- **Disorganization**
- **“Work pills”**
- **500,000 addicts**
- **Reduced supply**
- **Increased heroin**

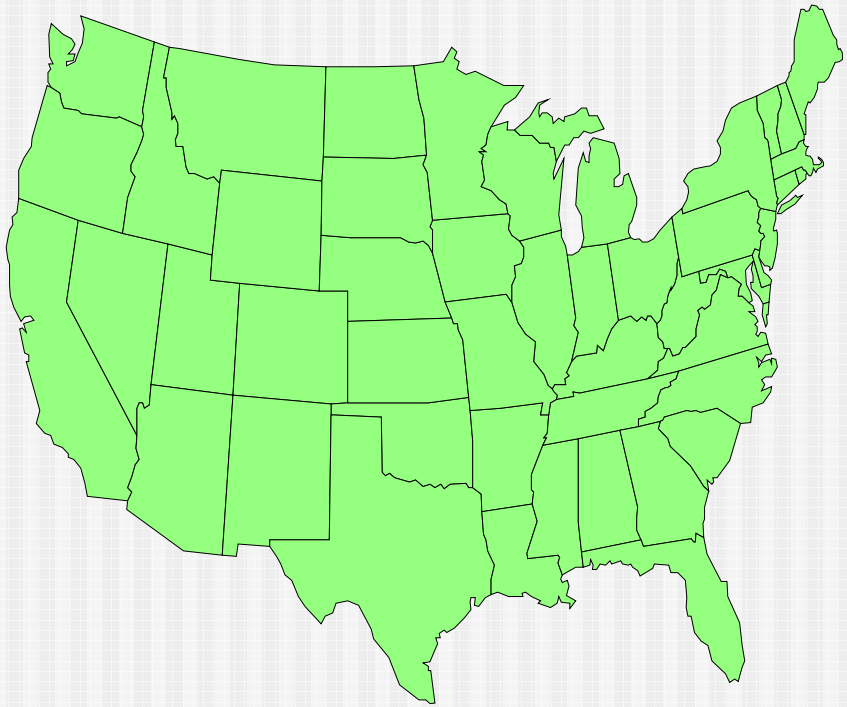
Methamphetamines
Speed in Sweden

SWEDEN



- **FACTORS**
- **Large supply**
- **3% are users**
- **Preludin widespread**
- **Mostly oral use**
- **“Speed clinics”**
- **Clinics closed**

Methamphetamines
A Previous U.S. Epidemic

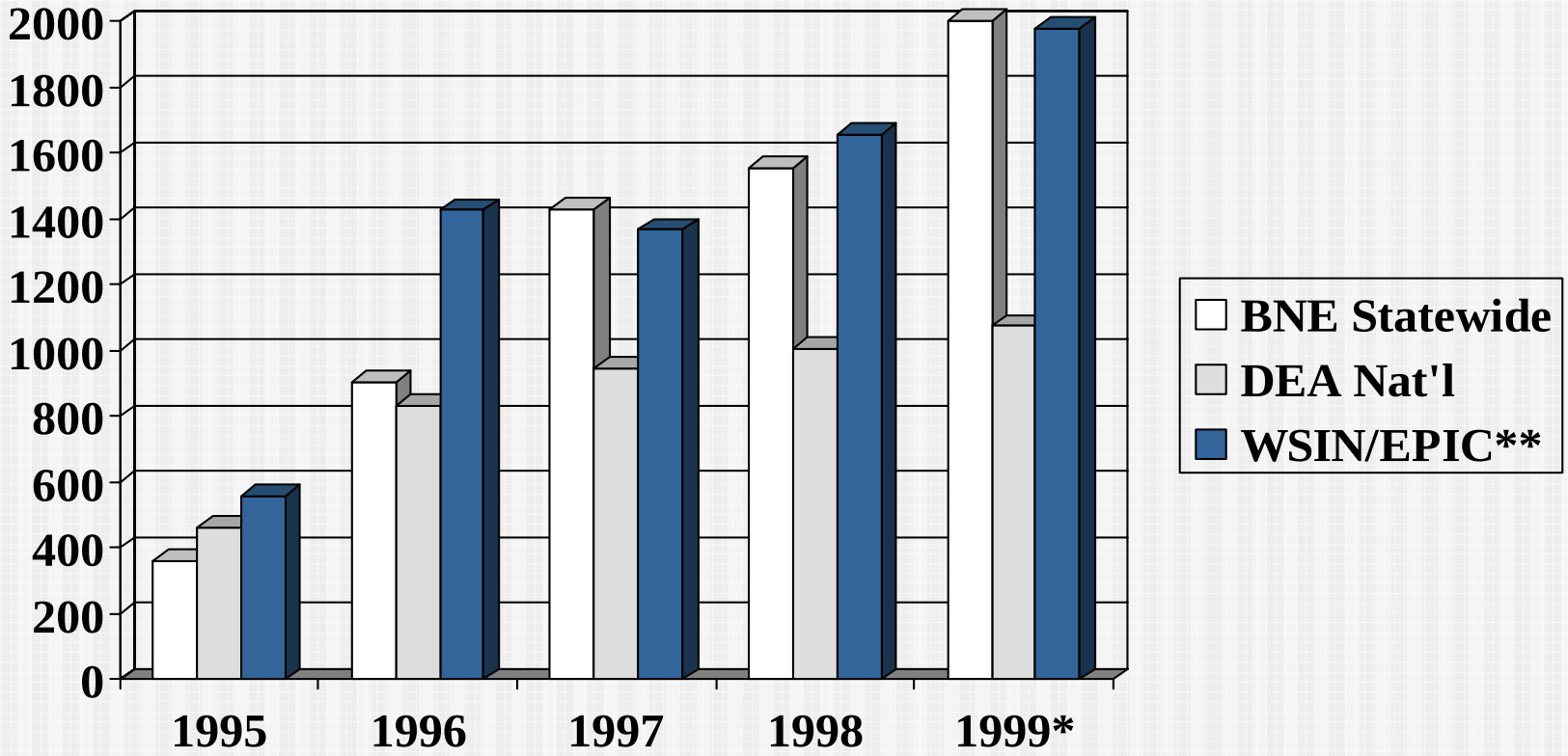


- **FACTORS**
- **More legal speed**
- **Base is legal**
- **Easy to make**
- **Large market**
- **Many IV users**
- **Law enforcement**
- **Rural areas**

Methamphetamines
Factors Related to Epidemic

- **Over supply**
- **Opportunity to experience**
- **Widespread knowledge**
- **A reliable market**
- **Non-parenteral methods**
- **Many “speed labs”**

Bureau of Narcotics Enforcement Clandestine Lab Seizures



*DEA still calculating statistics **CA statewide seizures, state and local combined

SOURCE: www.stopdrugs.org/images/1999nationallabstat.jpg

ADAM SITES IN THE WEST

Percent of Male Arrestees testing positive for Methamphetamine

Albuquerque	5.1
Denver	3.0
Las Vegas	16.2
Los Angeles	8.9
Phoenix	16.6
Portland	19.8
Sacramento	27.6
Salt Lake City	24.8
San Diego	26.0
San Jose	24.4
Seattle	9.0
Spokane	20.1
Tucson	5.8

National Institute of Justice

1999 ADAM Program Findings

ADAM Arrestee Drug Abuse Monitoring Program

Office of Justice Programs

ADAM SITES IN THE WEST

Percent of Female Arrestees testing positive for Methamphetamine

Albuquerque	8.9
Denver	2.4
Las Vegas	17.9
Los Angeles	12.0
Phoenix	14.3
Portland	24.8
Sacramento	32.4
Salt Lake City	34.1
San Diego	36.3
San Jose	31.6
Seattle	9.5
Spokane	26.6
Tucson	9.6

National Institute of Justice

1999 ADAM Program Findings

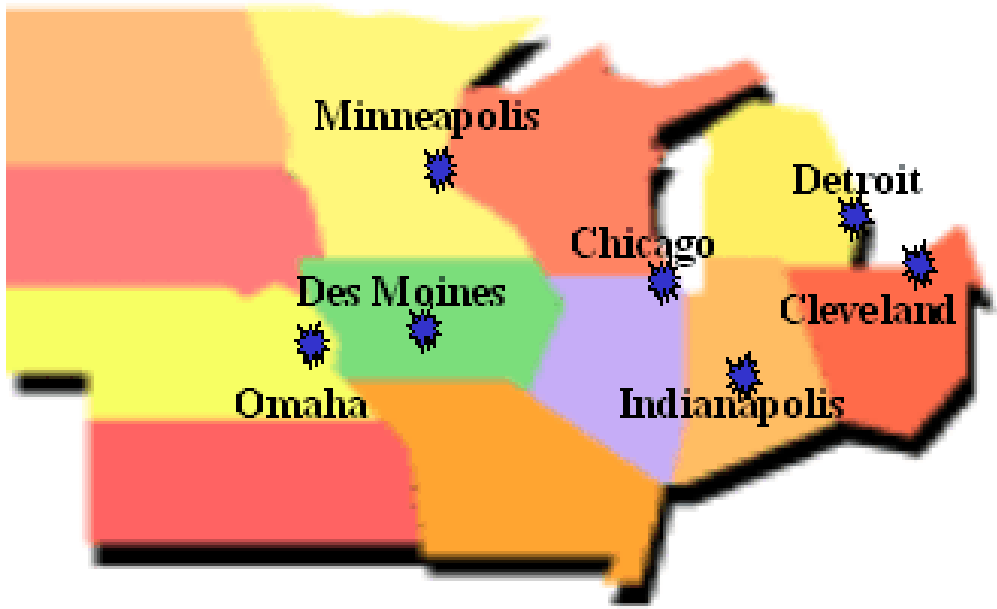
ADAM
Arrestee Drug Abuse Monitoring Program

Office of Justice Programs

MIDWEST ADAM SITES

Percent of Male Arrestees testing positive for Methamphetamine

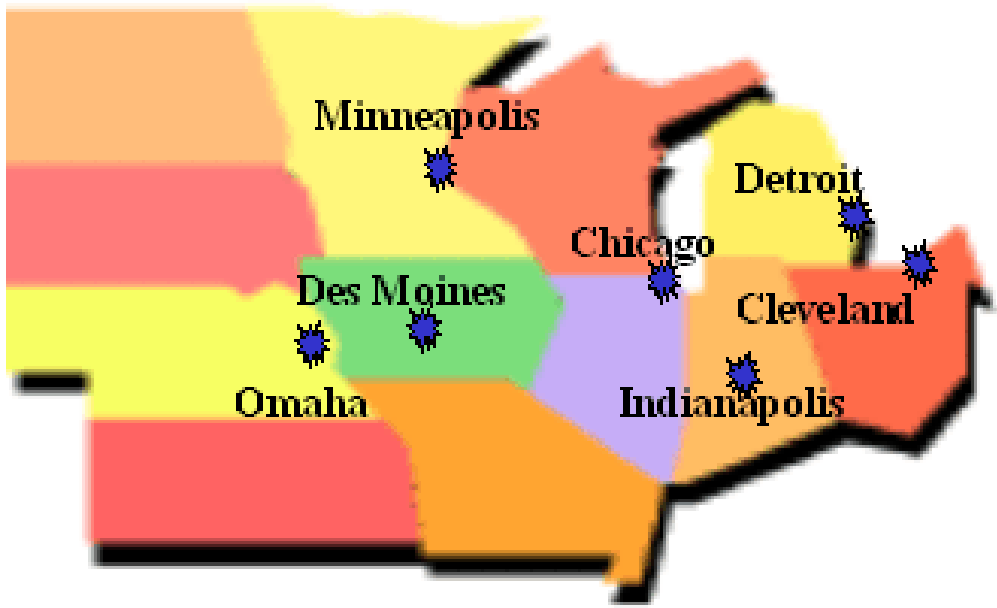
Cleveland	0.0
Chicago	0.0
Des Moines	14.0
Detroit	0.0
Indianapolis	0.6
Minneapolis	1.1
Omaha	7.8



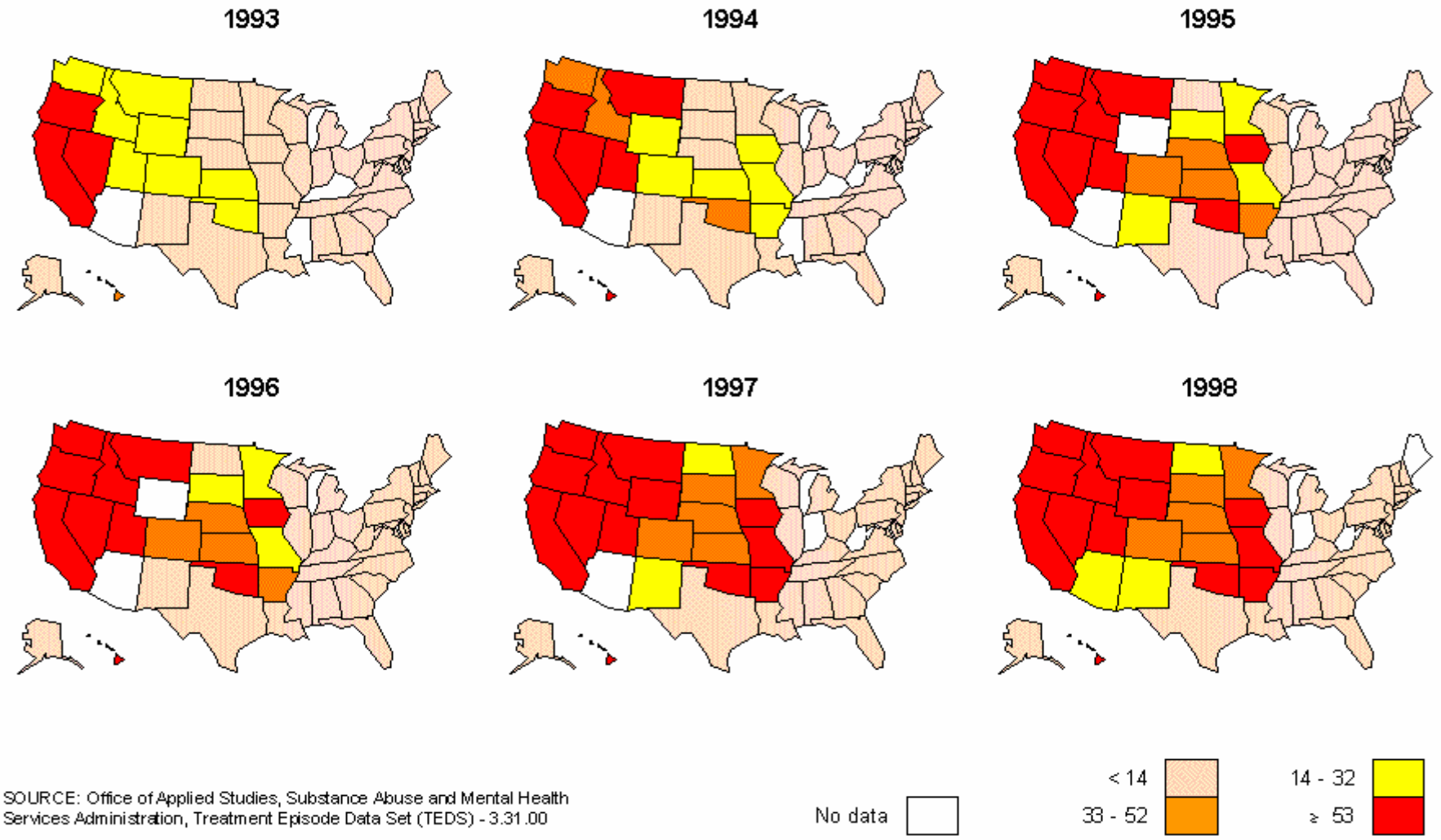
MIDWEST ADAM SITES

Percent of Female Arrestees testing positive for Methamphetamine

Cleveland	0.0
Chicago	0.0
Des Moines	22.4
Detroit	0.0
Indianapolis	0.5
Minneapolis	2.5
Omaha	11.1



Methamphetamine admissions per 100,000 population



SOURCE: Office of Applied Studies, Substance Abuse and Mental Health Services Administration, Treatment Episode Data Set (TEDS) - 3.31.00

Toxic Effects of Methamphetamine

- Manufacturing
- Abuse
- Fetal exposure

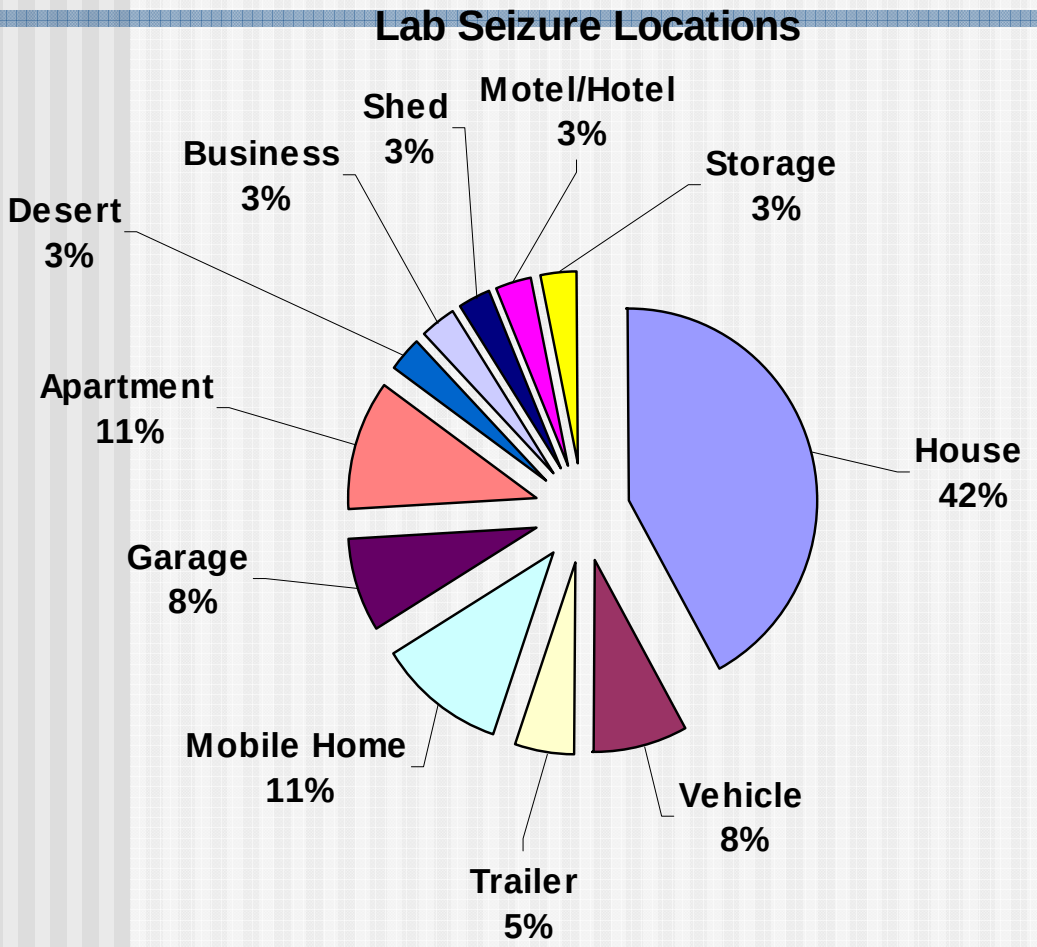
Clandestine Meth Lab

Clandestine Meth Lab Equipment

Meth Lab Seizures

- **A small percentage of labs seized are labeled “Super Labs” and are capable of producing over 10 lbs per batch.**
- **Super Labs are operated by Mexican National Drug Trafficking Organizations (MNDTO’s), and supply the majority of meth to the market.**

Lab Seizure Locations



- Most common meth lab facilities were single-family houses, followed by apartments, mobile homes, vehicles in traffic stops, garages, trailers, motels/hotels, businesses, desert, and storage.

Stove top labs

- Small, stove top labs comprise the bulk of clandestine laboratory seizures.
- Cookers make small amounts using household chemicals and equipment.

Stove Top Labs

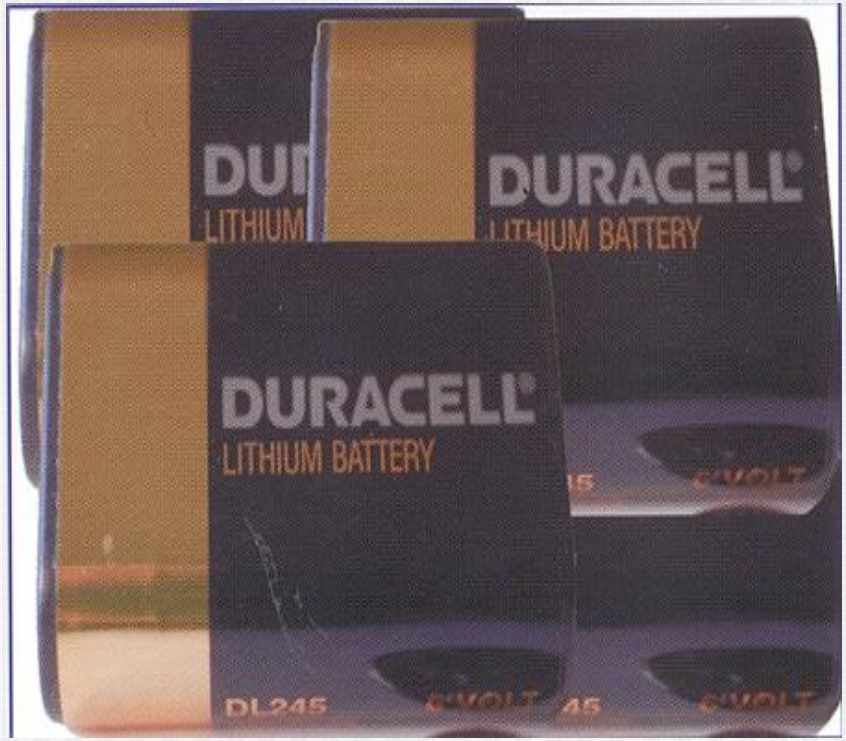
- The active ingredient in making methamphetamine is ephedrine or pseudoephedrine, commonly found in over the counter cold remedies.

Chemical Ingredients

- **Trichloroethane (Gun Scrubber)**
  Ether (Engine Starter)
- **Toluene (Brake Cleaner)**
- **Methanol (Gasoline Additive)**
- **Gasoline**
- **Kerosene**

Chemical Ingredients

- **Lithium (Camera Batteries)**
- **Anhydrous Ammonia (Farm Fertilizer)**
- **Red Phosphorus (Matches)**
- **Iodine (Veterinarian Products)**
- **Muriatic Acid**
- **Campfire Fuel**
- **Paint Thinner**



Chemical Ingredients

- **Acetone**
- **Sulfuric Acid (Drain Cleaner)**
- **Table Salt/Rock Salt**
- **Sodium Hydroxide (Lye)**
- **Sodium Metal (Can be made from Lye)**
- **Alcohol (Rubbing/Gasoline Additive)**

Household Equipment

- **Coffee Filters**
- **Rubber gloves**
- **Tempered Glass Baking Dishes**
- **Glass or Plastic Jugs**
- **Bottles**
- **Measuring Cup**

Household Equipment

- Glass Jars
- Funnels
- Blender
- Plastic Jugs
- Tape
- Turkey Baster
- Clamps
- Hotplate
- Strainer

Household Equipment

- **Rubber Tubing**
- **Paper Towels**
- **Gasoline Can**
- **Plastic Tote Box**
- **Aluminum Foil**
- **Propane Cylinder (2(lb)**
- **Books/internet (Meth lab Instruction)**

Toxicity

- Detrimental effects of meth labs reach further than increase in drug supply.
- For each quantity of methamphetamine manufactured, five times that amount is produced toxic wastes.
- Due to illegal nature of meth production, these toxic wastes are not disposed of lawfully (including heavy metals and flammable chemicals like mercury and phosphorus that should be transported to hazardous waste facilities.

Toxicity

- Instead they are dumped into streams, rivers, fields, and sewage systems, and buried illegally, allowing the toxins to seep into groundwater.

- This contaminates the environment and ground water, putting communities at risk.

Toxicity

- Gases created during the manufacturing process permeate walls and carpets of houses and building making them uninhabitable.
- The cost of cleaning these sites ranges from $2,000 to $4,000 taxpayer dollars.

Toxic Effects of Methamphetamine Manufacturing

- Fires
- Explosions
- Toxic gases
- Toxic wastes

Toxic Effects of Methamphetamine Manufacturing

- **Cooking**
  - **hydrochloric acid**
  - **mixing / heating red phosphorous**
  - **straining sodium hydroxide**
- **Extraction**
  - **solvents**
  - **conversion to base**
  - **extracting**
- **Salting**
  - **drying**

Toxic Effects of Methamphetamine Manufacturing

- Manufacturers
- Law enforcement officers
- Bystanders

bosses, not

DRESSED FOR METH ACCESS, AGENTS DEFUSE A POTENTIALLY EXPLOSIVE SITUATION.

Toxic Effects of Methamphetamine Manufacturing

- Air (immediate vicinity)
- Water supply
- Soil

Organ Toxicity from MA Abuse

- Central nervous system toxicity
- Cardiovascular toxicity
- Pulmonary toxicity
- Renal toxicity
- Hepatic toxicity

CNS Toxicity from MA Abuse

- Acute psychosis
- Chronic psychosis
- Strokes
- Seizures

Cardiovascular Toxicity from MA Abuse

- Arrhythmic sudden death
- Myocardial infarction
- Cardiomyopathy

Pulmonary Toxicity from MA Abuse

- Acute pulmonary congestion
- Chronic obstructive lung disease

Renal / Hepatic Toxicity from MA Abuse

- Renal failure
- Hepatic failure

Fetal Toxicity from MA Abuse

- Early effects:
  - fetal death
  - small for gestational age
- Late effects:
  - learning disability
  - poor social adjustment

Children

- Children who live in and around the area of the meth lab become exposed to the drug and its toxic precursors and byproducts.
- 80-90% of children found in homes where there are meth labs test positive for exposure to meth. Some are as young as 19 months old.

Children

- Children can test positive for methamphetamine by:
  - Having inhaled fumes during the manufacturing process
  - Coming into direct contact with the drug
  - Through second-hand smoke.

Children

- Hundreds of children are neglected by parents who are meth cooks. Nationally, over 20% of the seized meth labs in 2002 had children present.
- In Washington State, the counties of Grays Harbor, Spokane, Thurston, and Klickitat all reported that children were found at half the labs seized in 2002. In Lewis County, children were found at 60-70 %, and in Clark-Skamania, 35%.

Children

- In 2002, a total of 142 children were present at lab seizures in Riverside and San Bernardino Counties.
- Most children reported as being present during a seizure were school age.

Children

- Social workers now accompany law enforcement during lab seizures with children involved.
  - Parents are often charged with second-degree criminal mistreatment, along with manufacturing charges.
  - Allowing children to live in a toxic environment where additional risks of explosion and fire are high is considered to be neglect at best to child abuse.

Children

- Children have a greater skin surface area per pound than do adults, making them more susceptible to environmental contaminants.
- They also eat, drink, and breathe faster, and are more likely to put hands and other objects in their mouths.

Children

- Inquisitive nature of young children makes them more prone to accidentally consuming toxic chemicals that are sometimes kept in unmarked containers in the refrigerator.

Children

- Children are uniquely susceptible to neurological contamination in the environment because their brains are still developing.
- Lead poisoning is an example of what the child is exposed to in these meth labs. A small amount of lead that may not affect an adult can cause neurological damage in a child.

What *Does* Child Welfare Field Need in Context of Meth & Labs?

- Support from Auxiliary Agencies and Departments
- Policies that Protect their Safety
- Policies that Appropriately Safeguard Children
- Resources to Support Meth-dependent parents in treatment & recovery in the context of reunification efforts
- Training for Caregivers and Treatment Staff to implement best practices for parents & kids

Drug Endangered Children: Who Should be Involved?

- **CHILD PROTECTIVE SERVICES (24/7)**
- **MEDICAL & PUBLIC HEALTH PERSONNEL (24/7)**
- **LAW ENFORCEMENT (24/7) (If Lab)**
- **DISTRICT ATTORNEY'S OFFICE (24/7) (If Lab)**

- (CORE DEC RESPONSE TEAM MEMBERS)

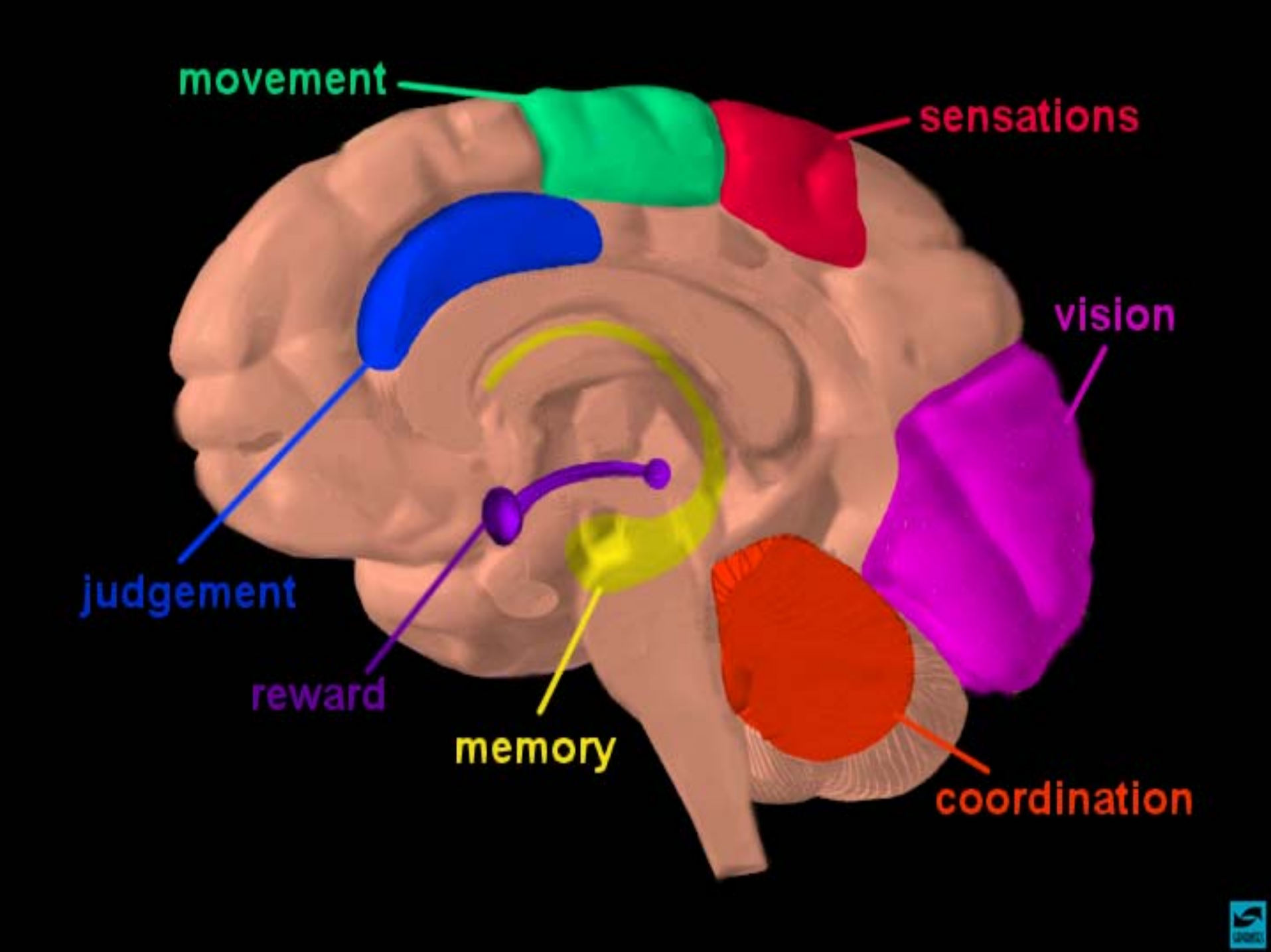
ADDITIONAL INVOLVEMENT FROM:

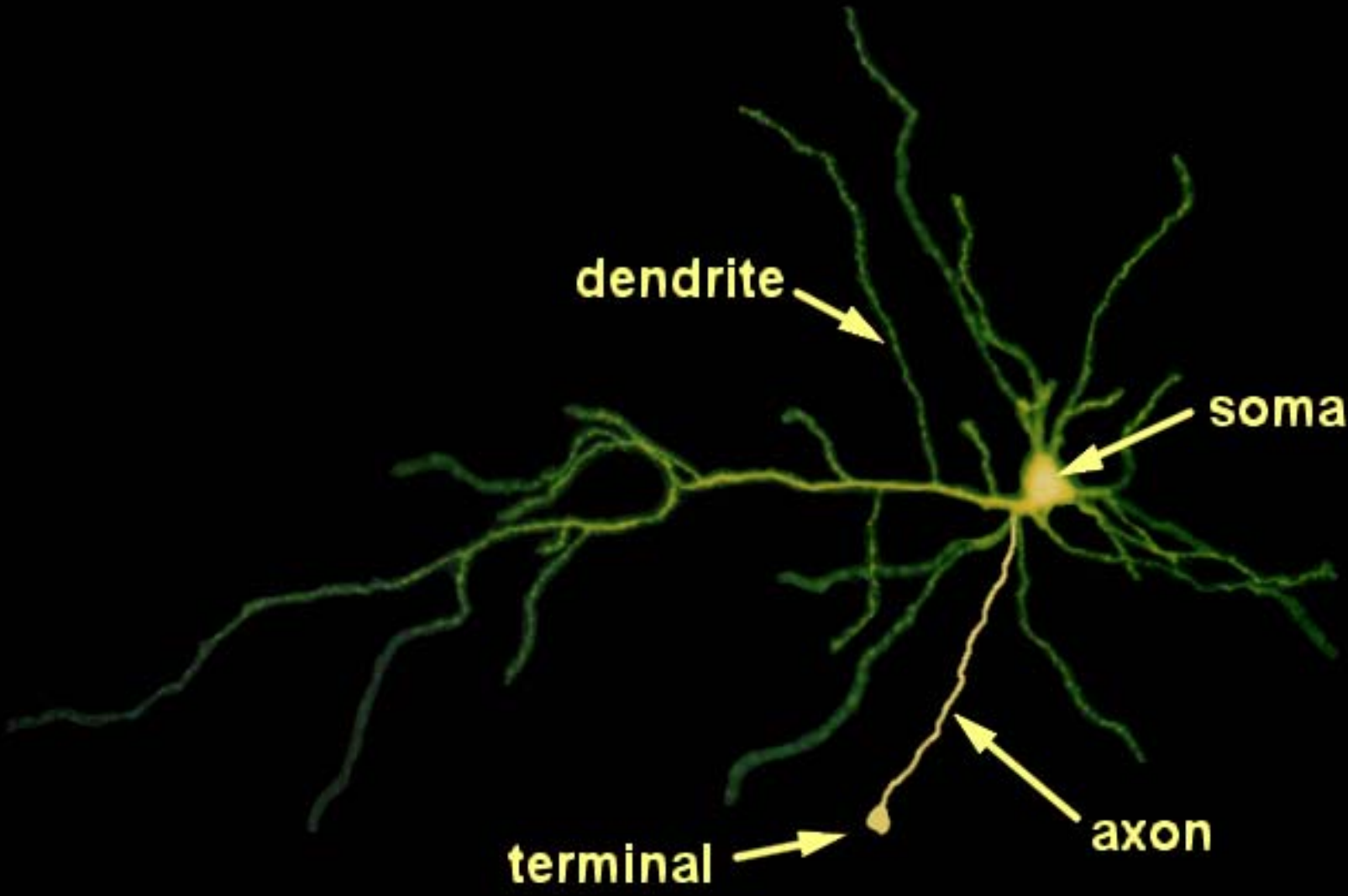
- **MENTAL HEALTH & THERAPEUTIC PERSONNEL**
- **CHILD CARE PROVIDERS: FOSTER FAMILIES**
- **DRUG & ALCOHOL TREATMENT PROVIDERS**
- **ENVIRONMENTAL SERVICES & HAZARDOUS MATERIALS TEAM PERSONNEL (If Lab)**

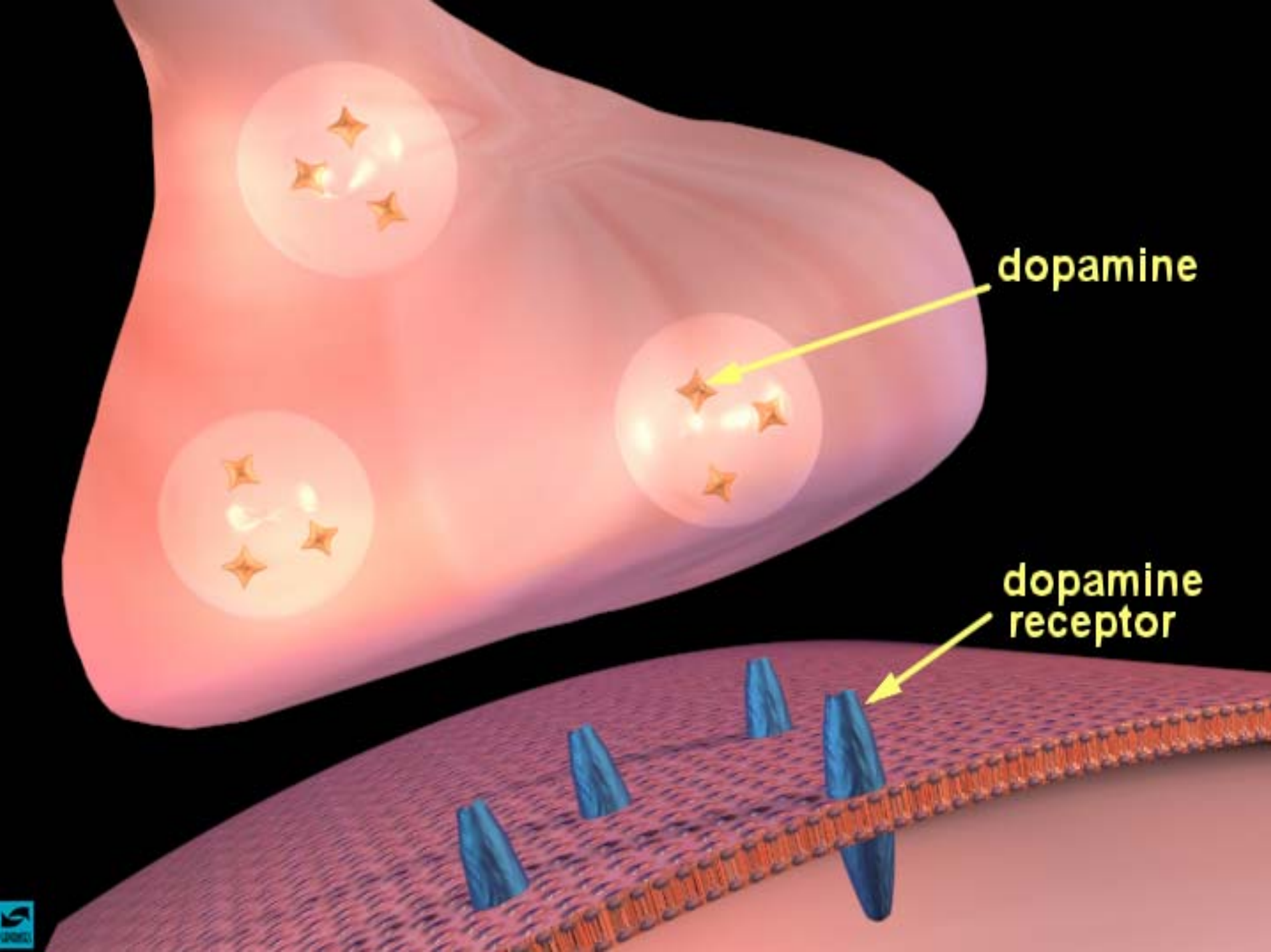
Drug Endangered Children Response Teams

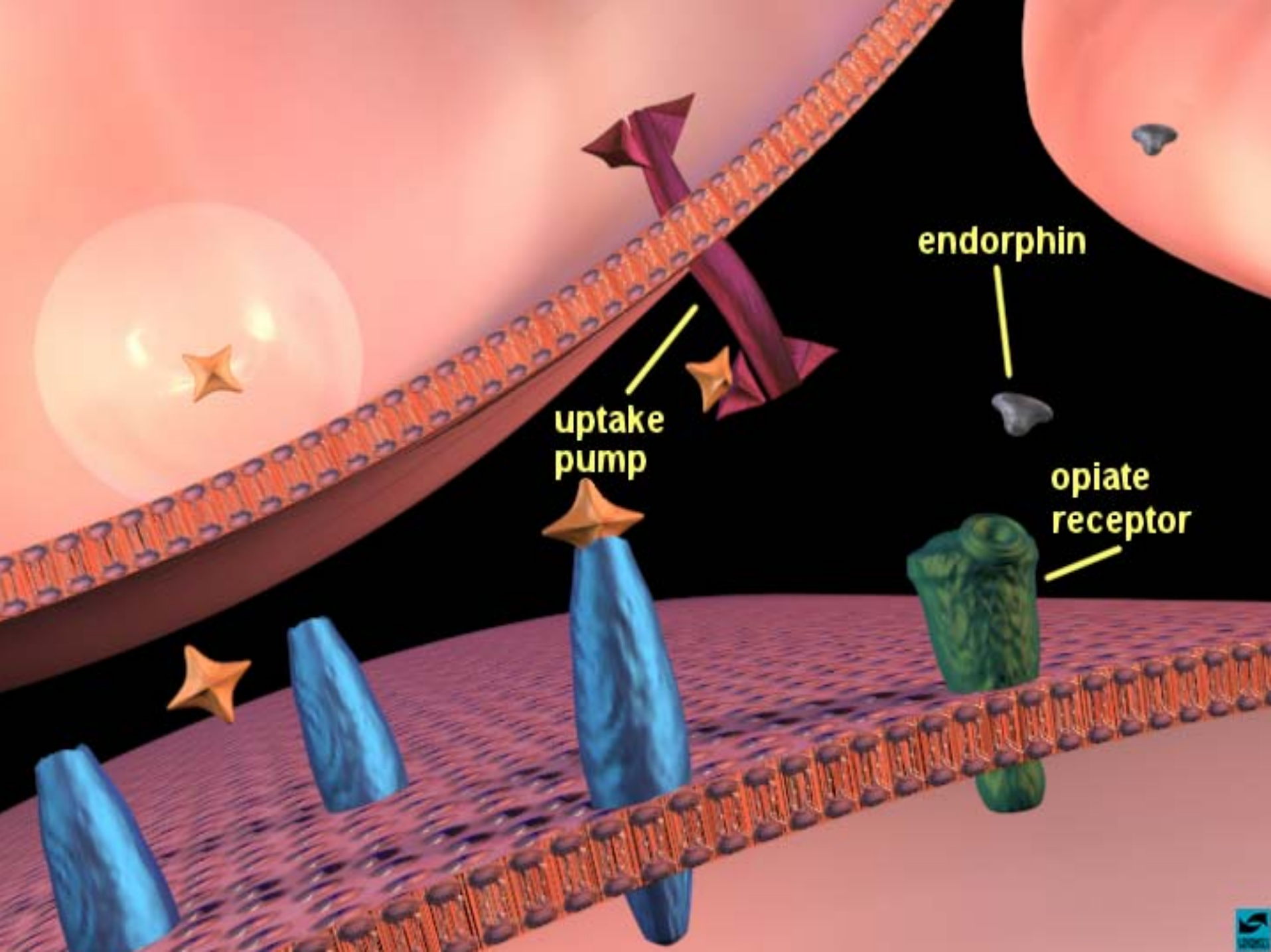
Why the Team Concept Is Needed and Works...

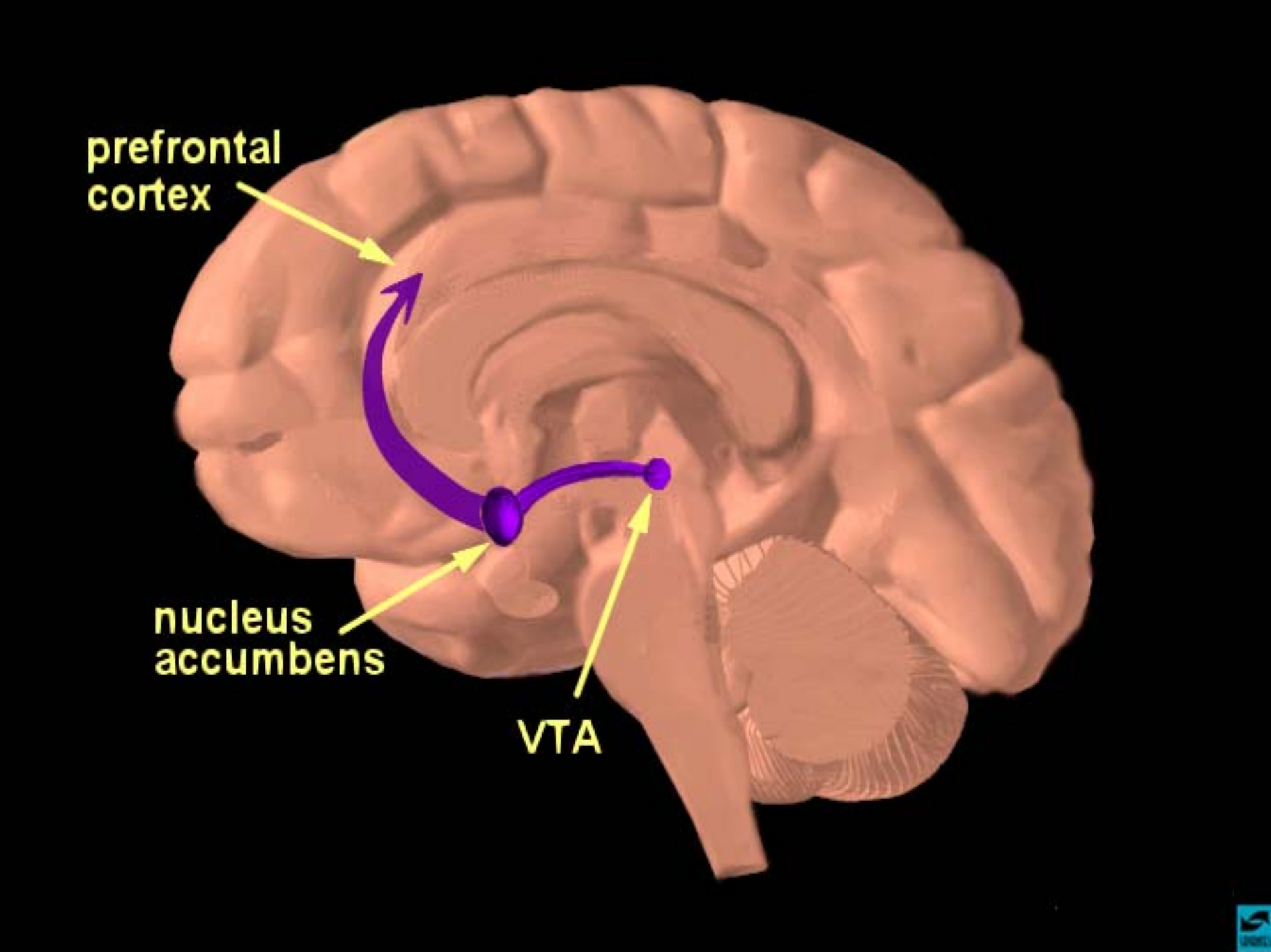
- **Multi-Need Families; Multi-Need Individuals**
- **Multi-Disciplinary Approach**
- **Spirit of Cooperation**
- **Sharing of Information**
- **Case Coordination for Best Family and Individual Outcome**

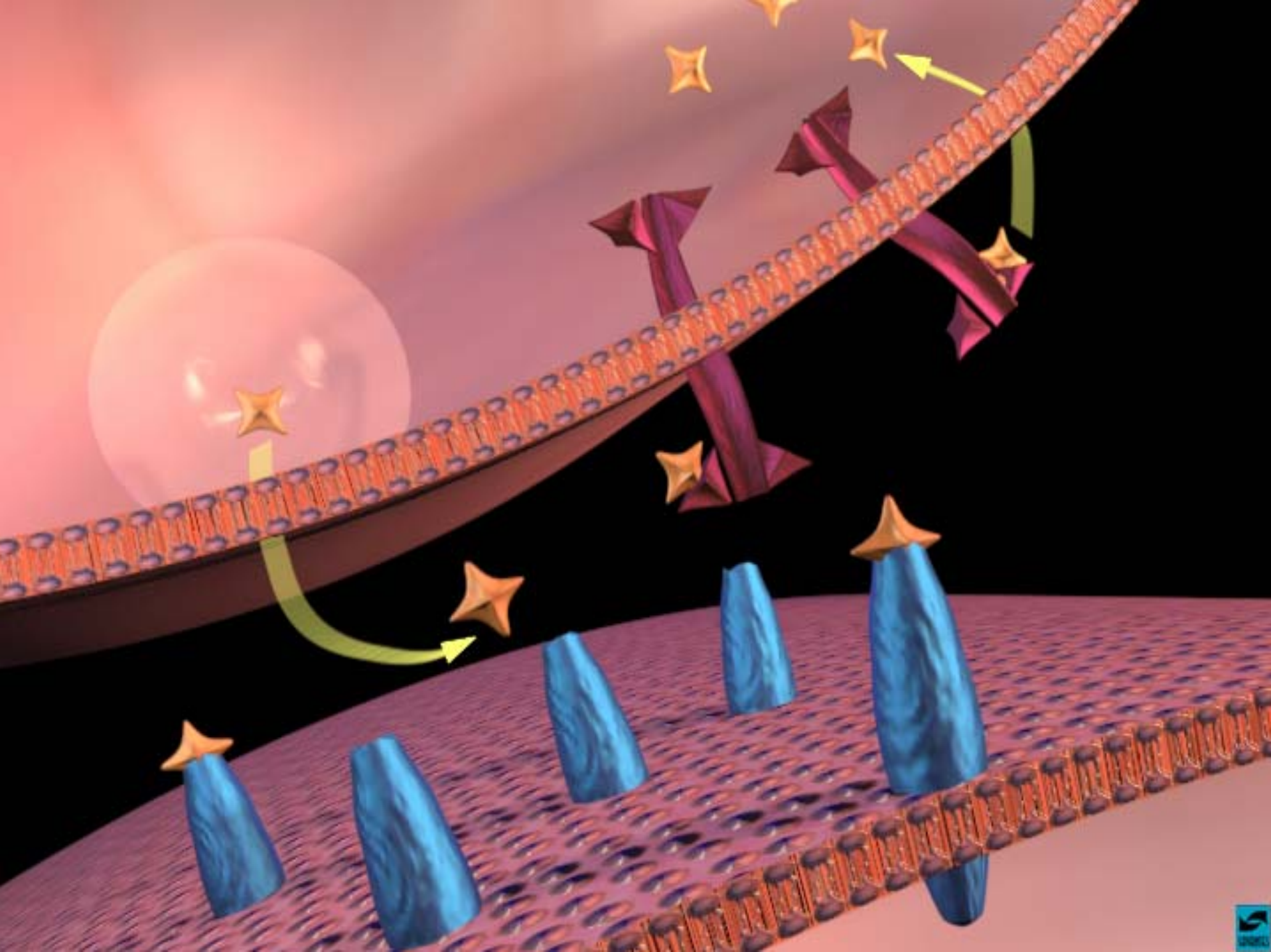

movement
sensations
vision
judgement
reward
memory
coordination

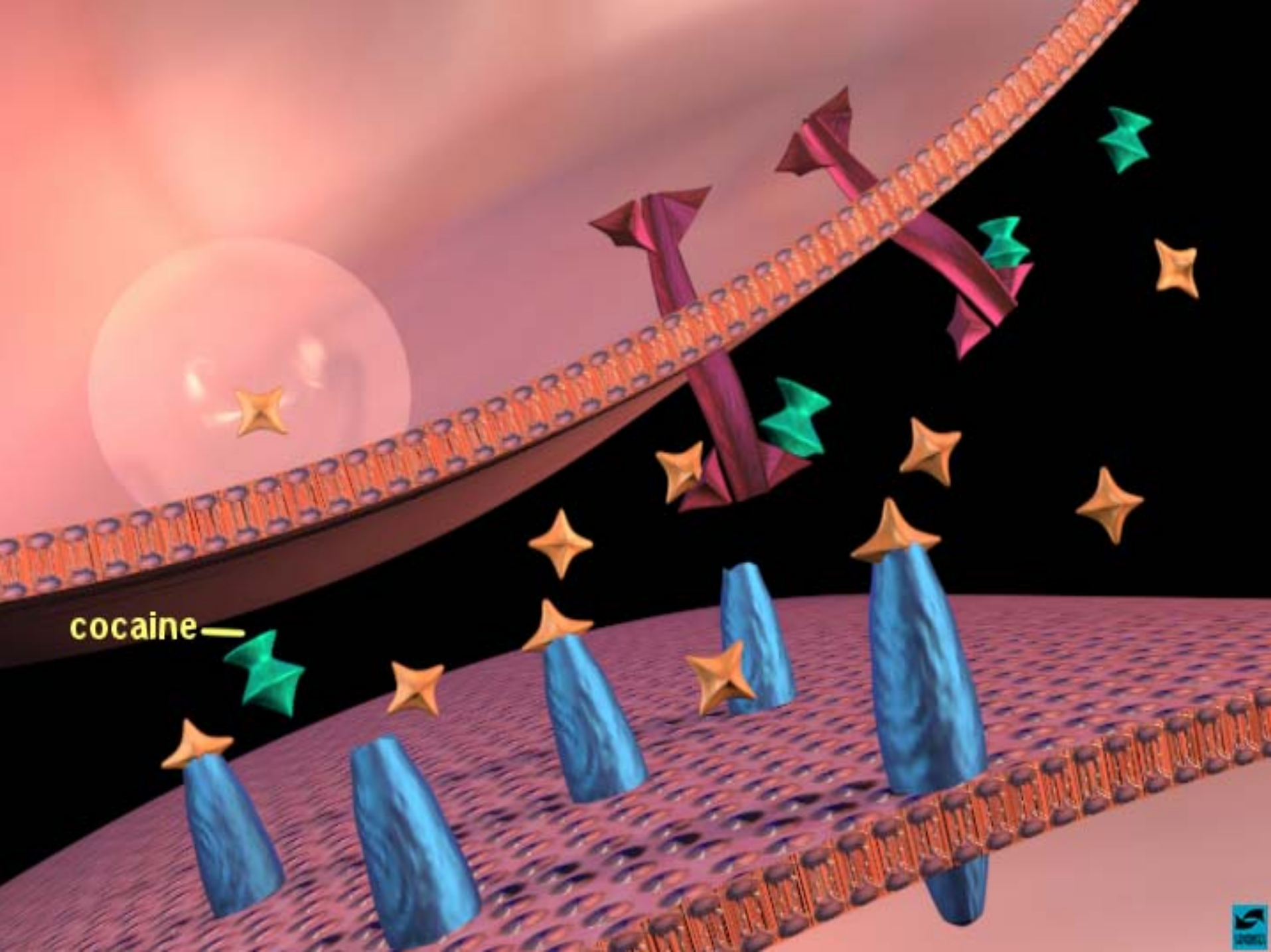

dendrite
soma
axon
terminal

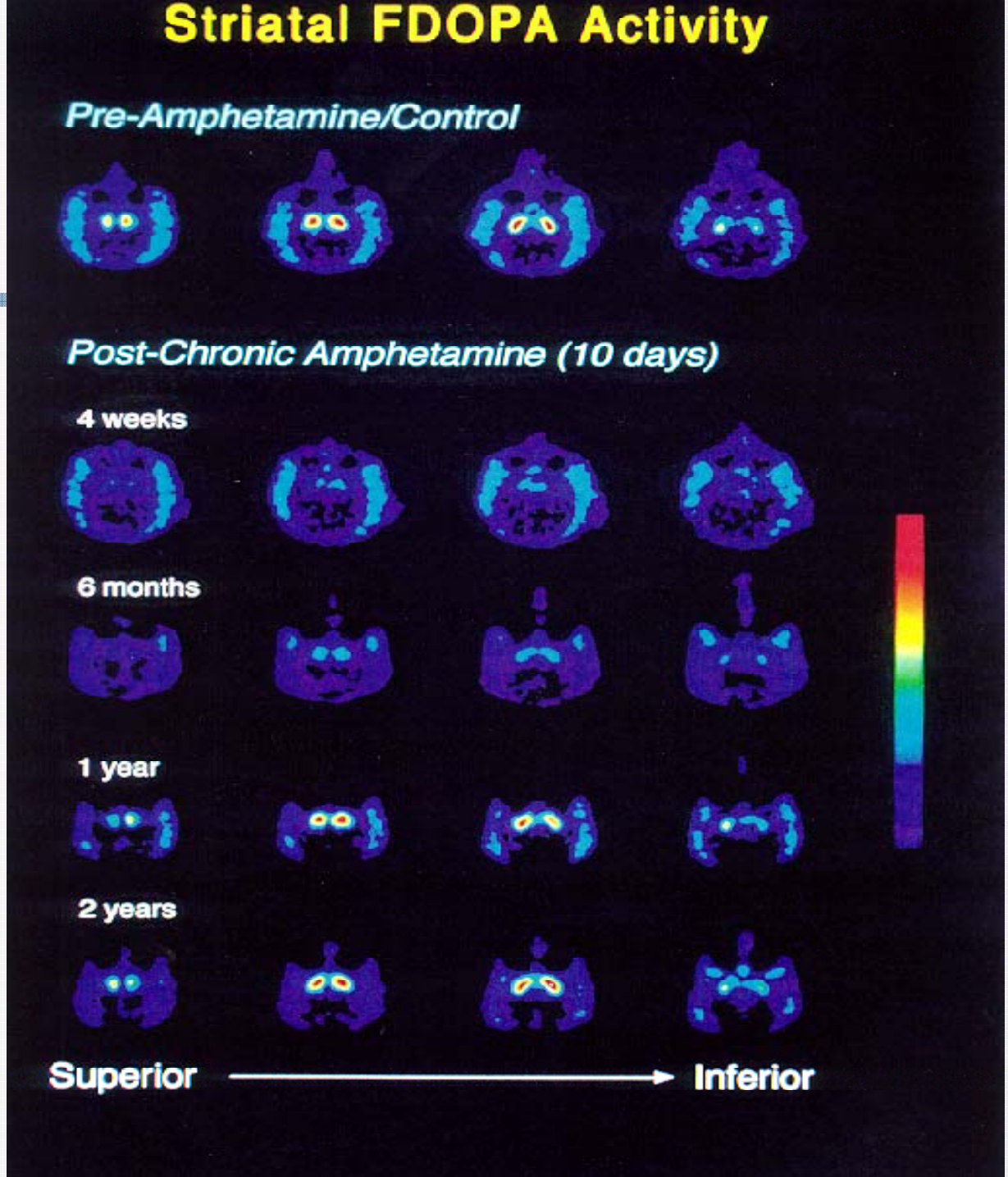

dopamine
dopamine receptor

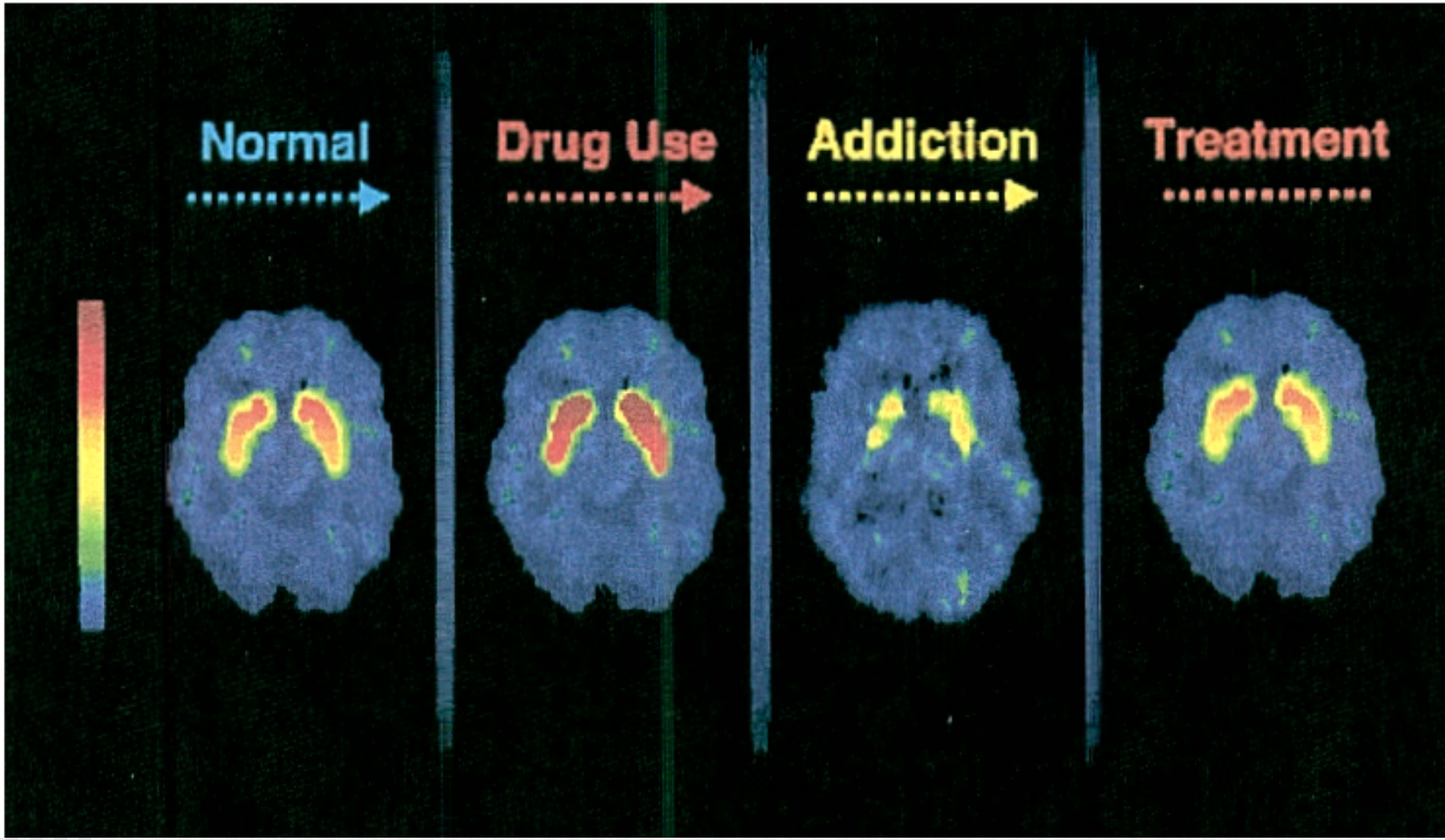

endorphin
uptake
pump
opiate
receptor


prefrontal
cortex
nucleus
accumbens
VTA




cocaine

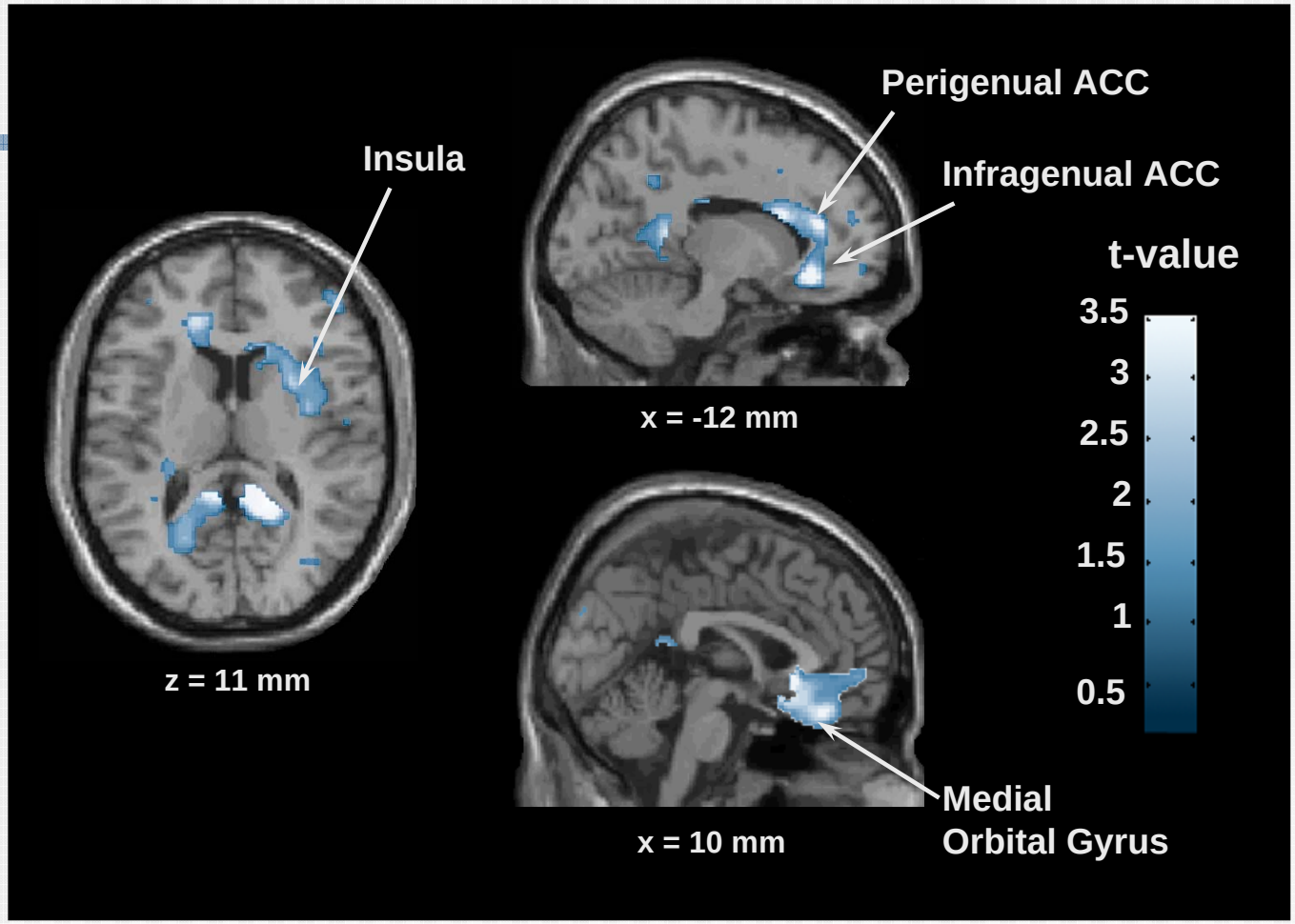

Striatal FDOPA Activity
Pre-Amphetamine/Control
Post-Chronic Amphetamine (10 days)
4 weeks
6 months
1 year
2 years
Superior
Inferior

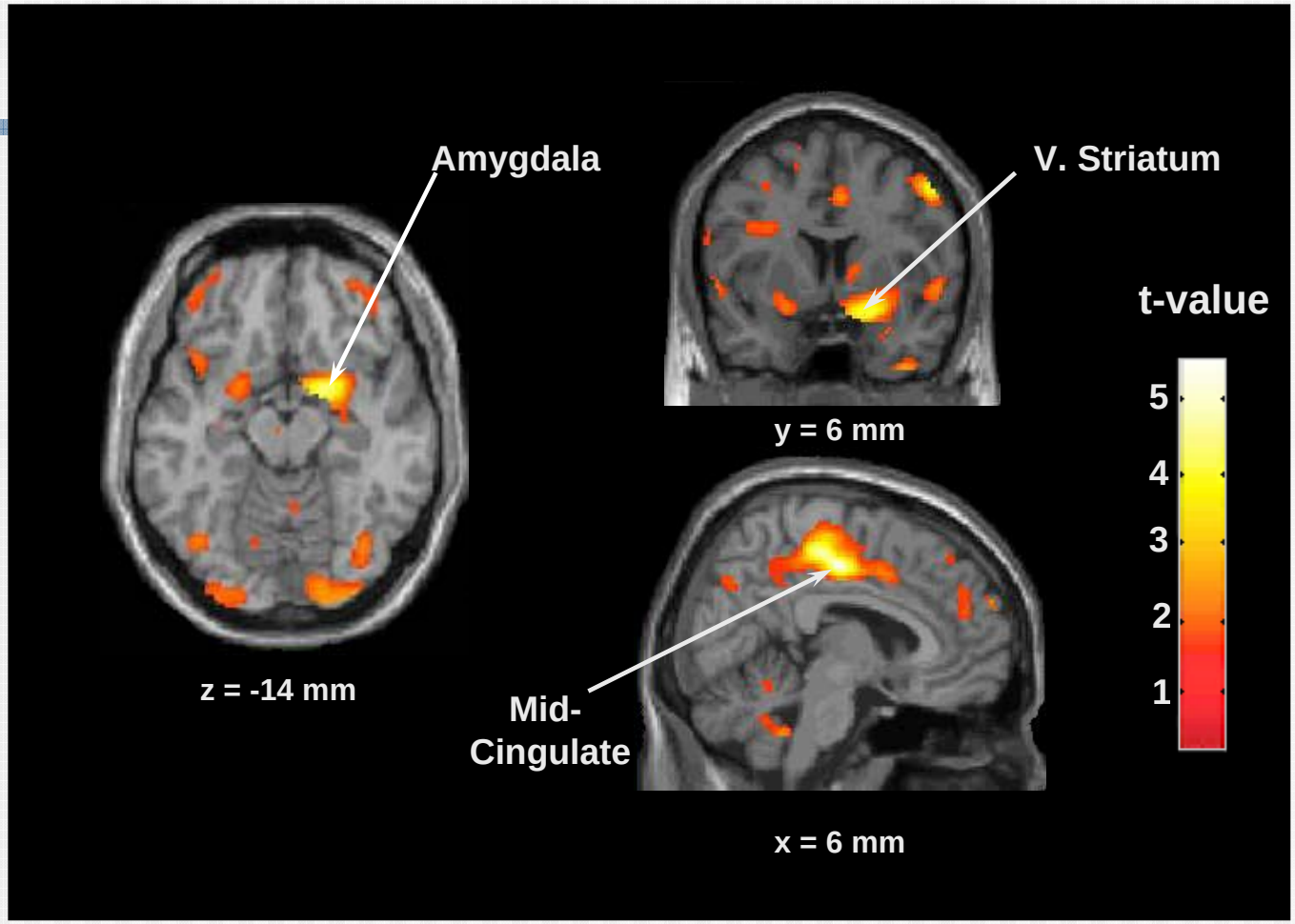

Normal
Drug Use
Addiction
Treatment

Brain metabolism in newly abstinent methamphetamine users

- Edythe London
- Walter Ling
- Richard Rawson

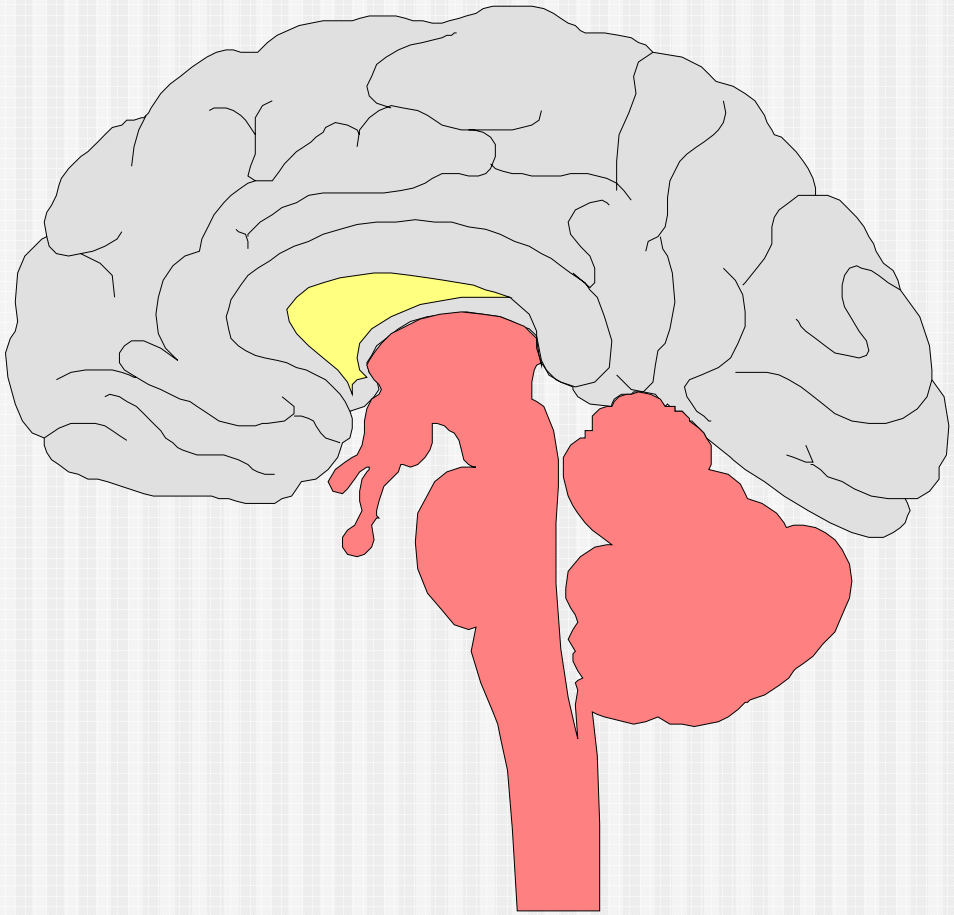
UCLA School of Medicine


Perigenual ACC
Infragenual ACC
Insula
t-value
3.5
3
2.5
2
1.5
1
0.5
x = -12 mm
z = 11 mm
x = 10 mm
Medial
Orbital Gyrus


Amygdala
V. Striatum
t-value
5
4
3
2
1
y = 6 mm
z = -14 mm
Mid-
Cingulate
x = 6 mm

Triggers and Cravings

Human Brain



Cognitive Process During Addiction

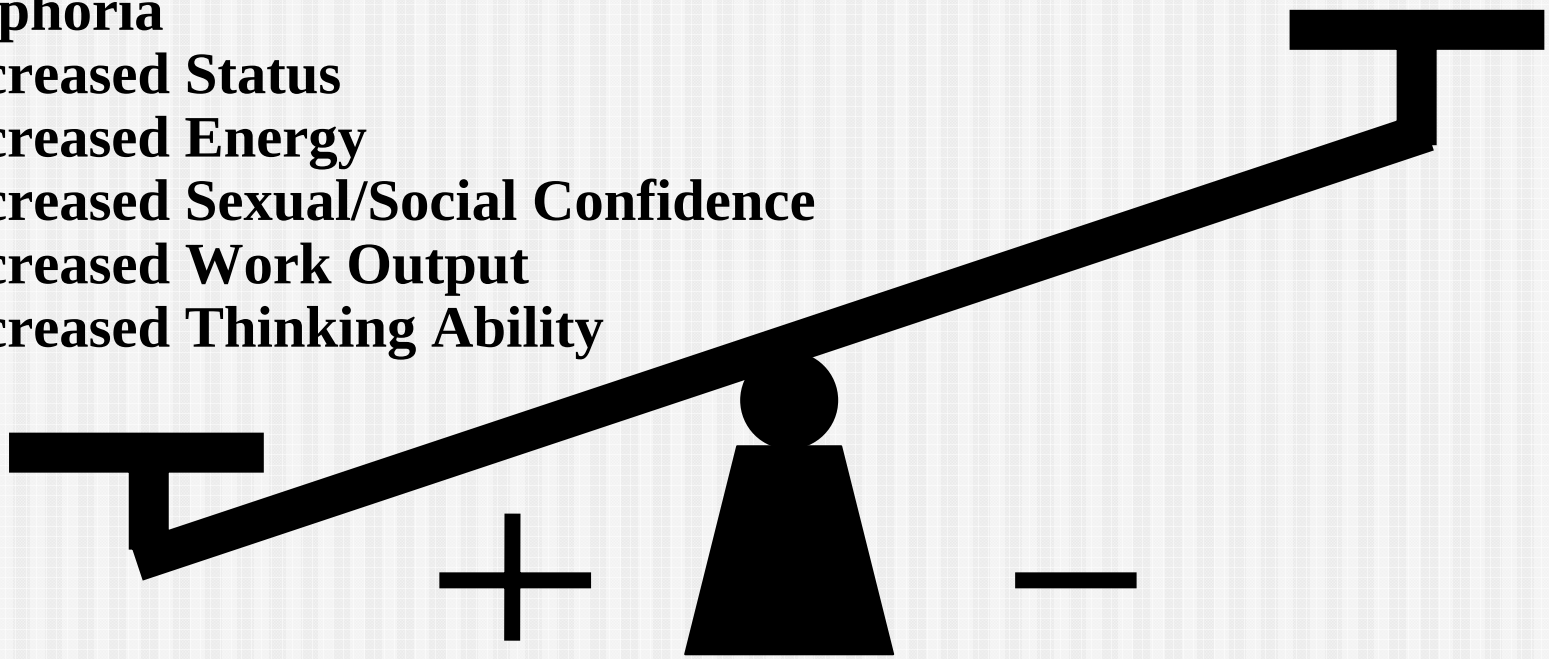
Introductory Phase

<u>Relief From</u>

Depression
Anxiety
Loneliness
Insomnia
Euphoria
Increased Status
Increased Energy
Increased Sexual/Social Confidence
Increased Work Output
Increased Thinking Ability

} **AOD**

May Be Illegal
May Be Expensive
Hangover/Feeling Ill
May Miss Work

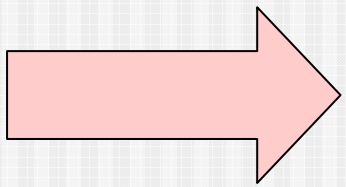


Conditioning Process During Addiction

Introductory Phase

Strength of Conditioned Connection

Mild



<u>Triggers</u>

- **Parties**
- **Special Occasions**

<u>Responses</u>

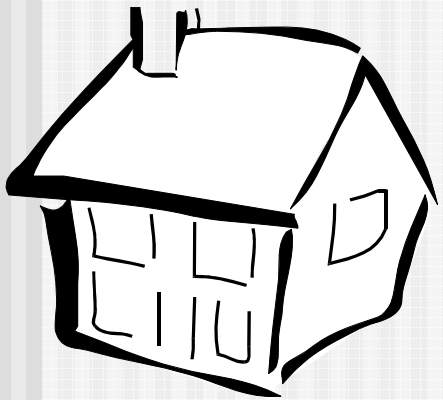
- **Pleasant Thoughts about AOD**
- **No Physiological Response**
- **Infrequent Use**

Development of Obsessive Thinking
Introductory Phase

Development of Craving Response

Introductory Phase

Entering Using Site



Use of AODs

AOD Effects

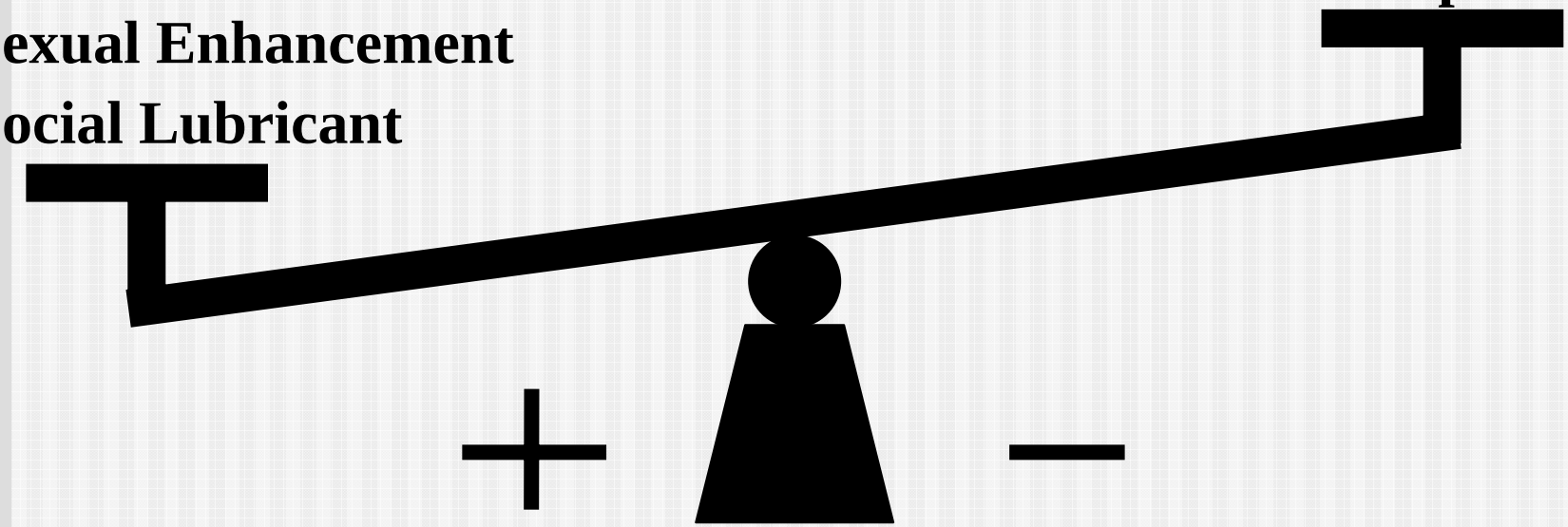
- ↕ Heart/Pulse Rate
- ↕ Respiration
- ↕ Adrenaline
- ↕ Energy
- ↑ Taste

Cognitive Process During Addiction

Maintenance Phase

Depression Relief
Confidence Boost
Boredom Relief
Sexual Enhancement
Social Lubricant

Vocational Disruption
Relationship Concerns
Financial Problems
Beginnings of Physiological Dependence



Conditioning Process During Addiction

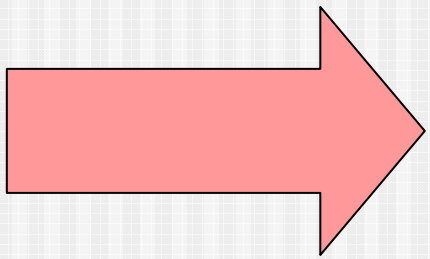
Maintenance Phase

Strength of Conditioned Connection

Triggers

- Parties
- Friday Nights
- Friends
- Concerts
- Alcohol
- "Good Times"
- Sexual Situations

Moderate



Responses

- Thoughts of AOD
- Eager Anticipation of AOD Use
- Mild Physiological Arousal
- Cravings Occur as Use Approaches
- Occasional Use

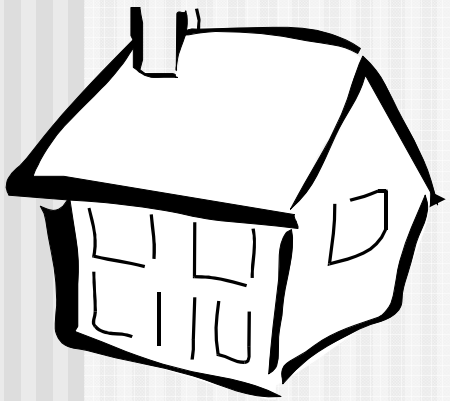
Development of Obsessive Thinking

Maintenance Phase

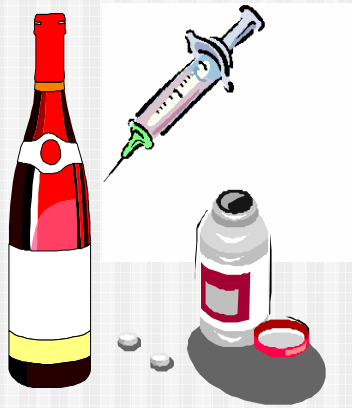
Development of Craving Response

Maintenance Phase

Entering Using Site → **Physiological Response** → **Use of AODs** → **AOD Effects**



- ↑ Heart
- ↑ Breathing
- ↑ Adrenaline Effects
- ↑ Energy Taste



- ↕ Heart
- ↕ Blood Pressure
- ↕ Energy

Cognitive Process During Addiction

Disenchantment Phase

Social Currency

Occasional Euphoria

Relief From Lethargy

Relief From Stress

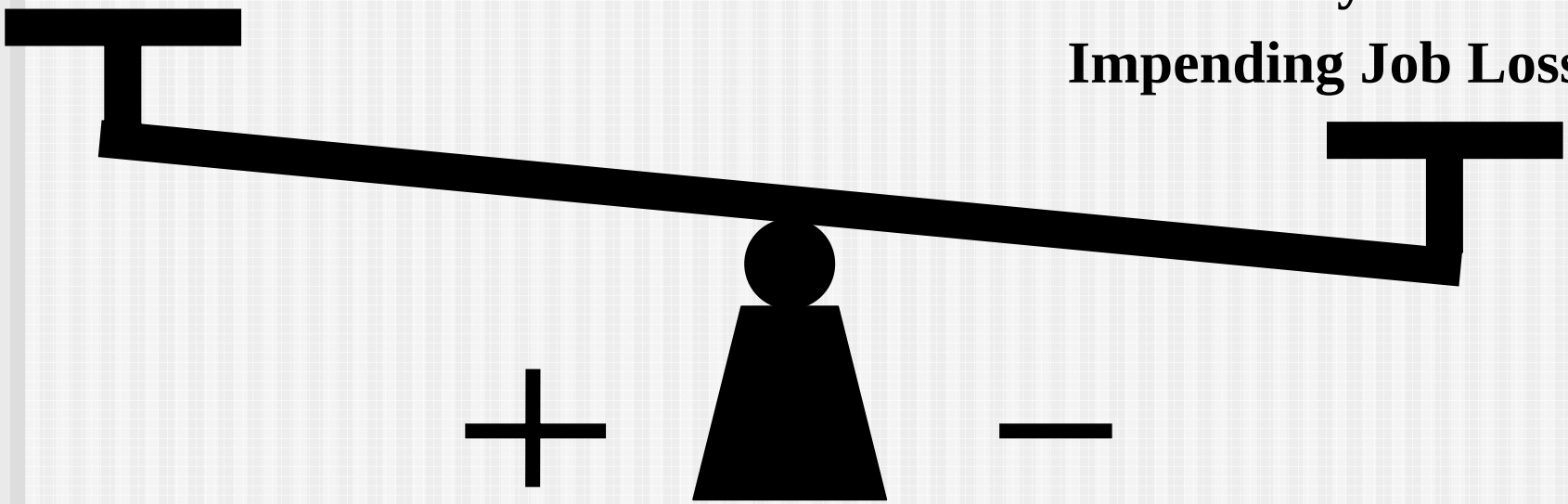
Nose Bleeds

Infections

Relationship Disruption

Family Distress

Impending Job Loss



Conditioning Process During Addiction

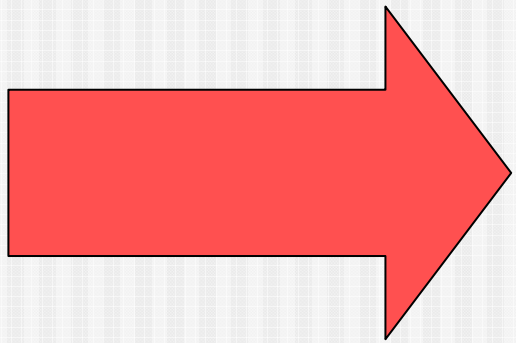
Disenchantment Phase

Strength of Conditioned Connection

Triggers

- Weekends
- All Friends
- Stress
- Boredom
- Anxiety
- After Work
- Loneliness

STRONG

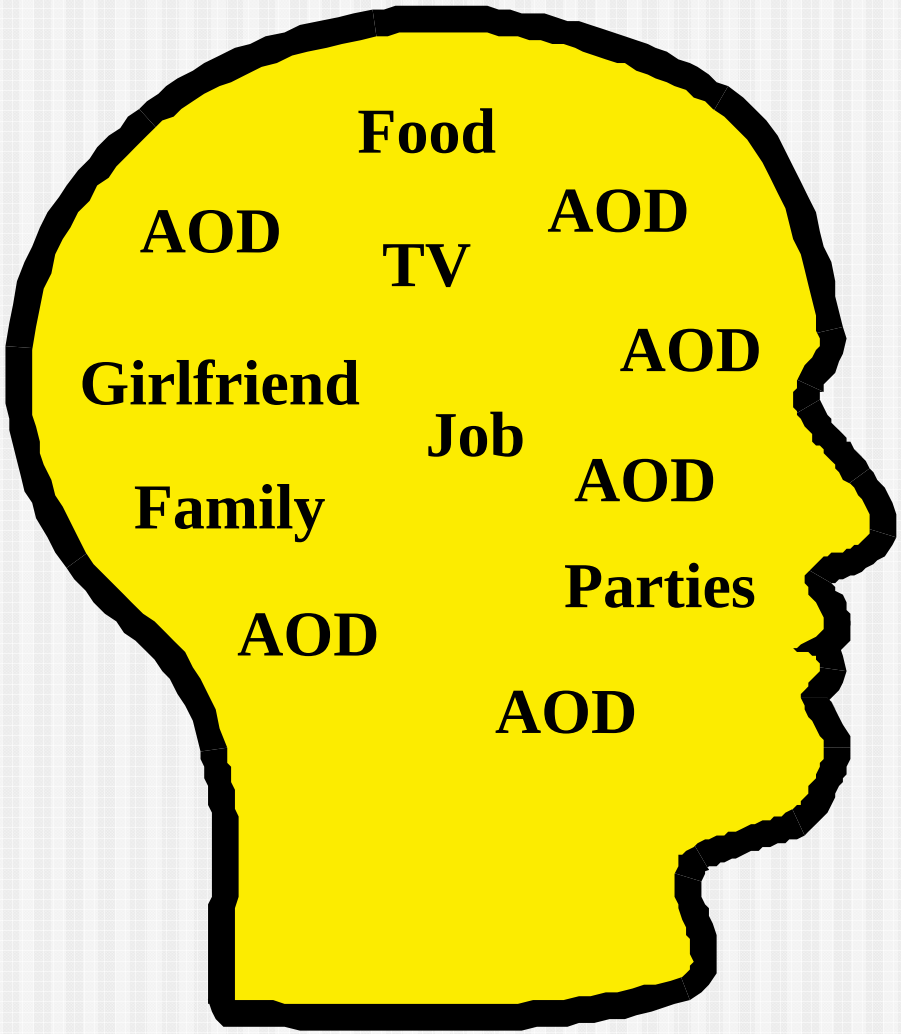


Responses

- Continual Thoughts of AOD
- Strong Physiological Arousal
- Psychological Dependency
- Strong Cravings
- Frequent Use

Development of Obsessive Thinking

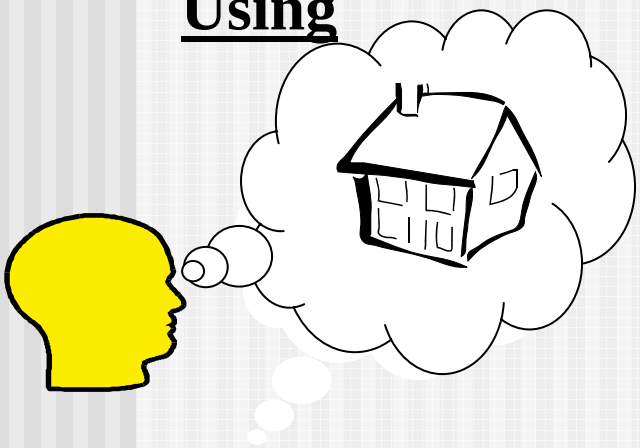
Disenchantment Phase



Development of Craving Response

Disenchantment Phase

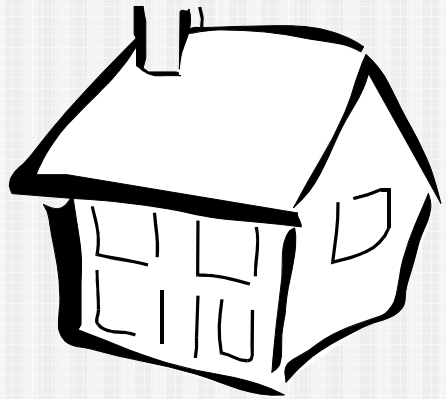
Thinking of Using



Mild Physiological Response

- ↑ Heart Rate
- ↑ Breathing Rate
- ↑ Energy
- ↑ Adrenaline Effects

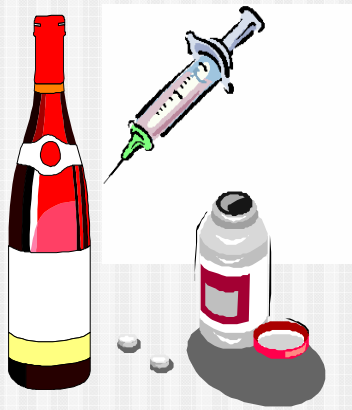
Entering Using Site



Powerful Physiological Response

- ↑ Heart Rate
- ↑ Breathing Rate
- ↑ Energy
- ↑ Adrenaline Effects

Use of AODs



AOD Effects

- ↕ Heart
- ↕ Blood Pressure
- ↕ Energy

Cognitive Process During Addiction

Disaster Phase

Relief From Fatigue

Relief From Stress

Relief From Depression

Weight Loss

Paranoia

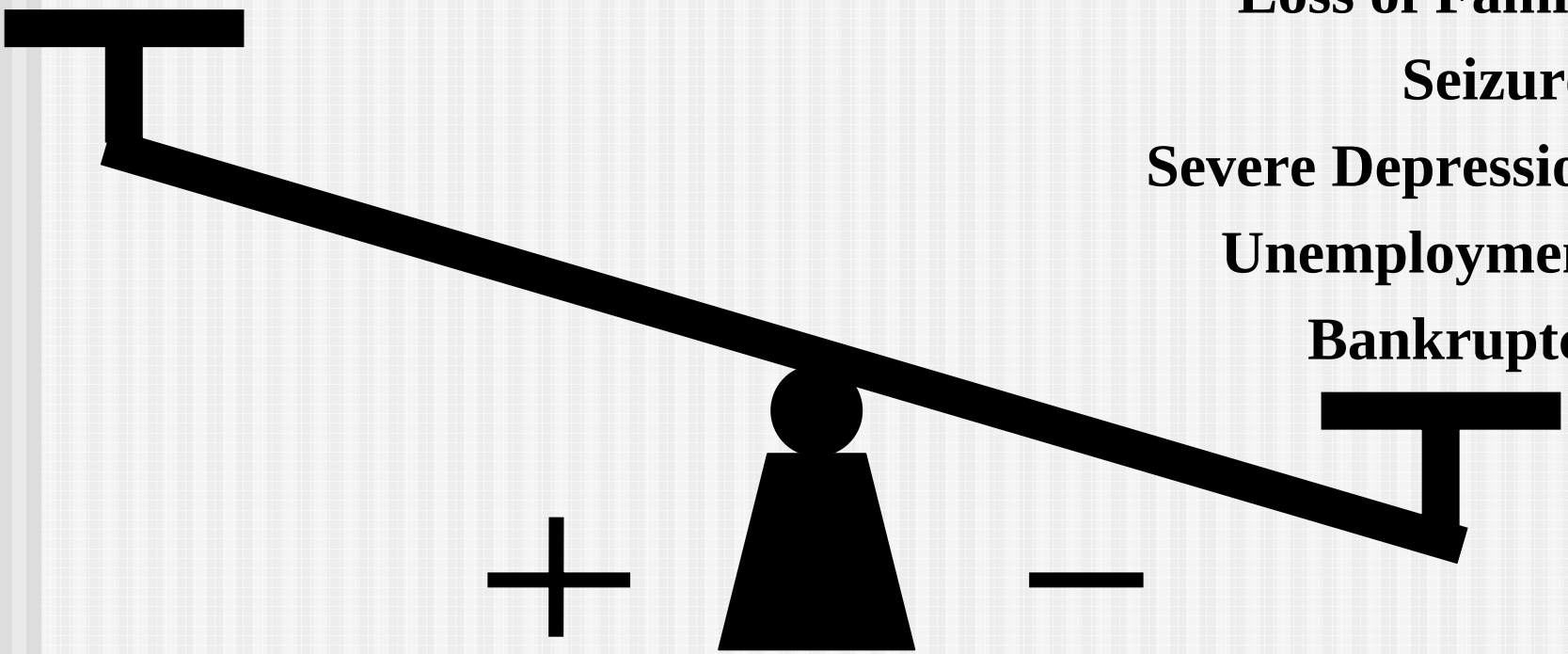
Loss of Family

Seizures

Severe Depression

Unemployment

Bankruptcy



Conditioning Process During Addiction

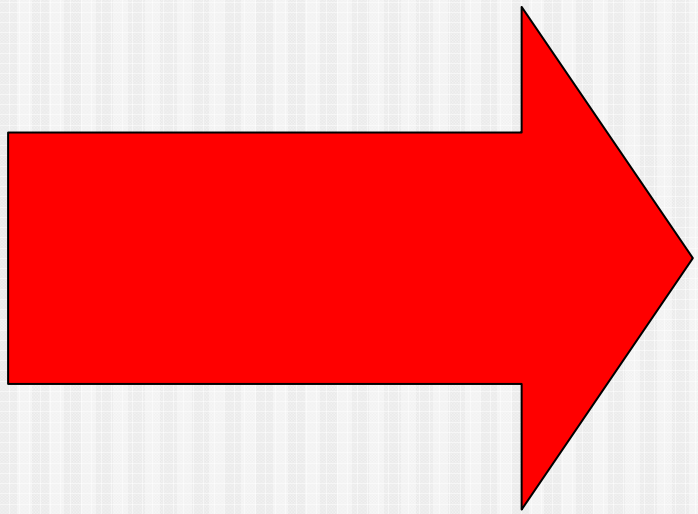
Disaster Phase

Strength of Conditioned Connection

OVERPOWERING

Triggers

- Any Emotion
- Day
- Night
- Work
- Non-Work

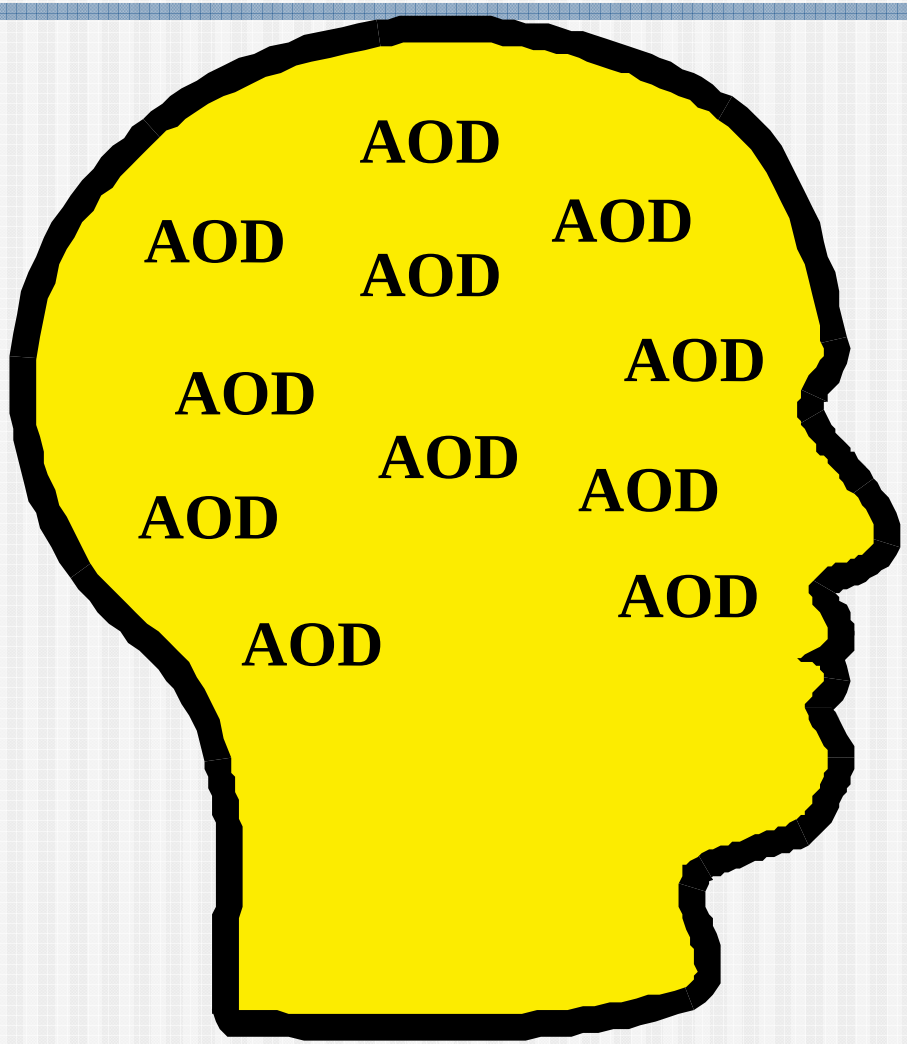


Responses

- Obsessive Thoughts About AOD
- Powerful Autonomic Response
- Powerful Physiological Dependence
- Automatic Use

Development of Obsessive Thinking

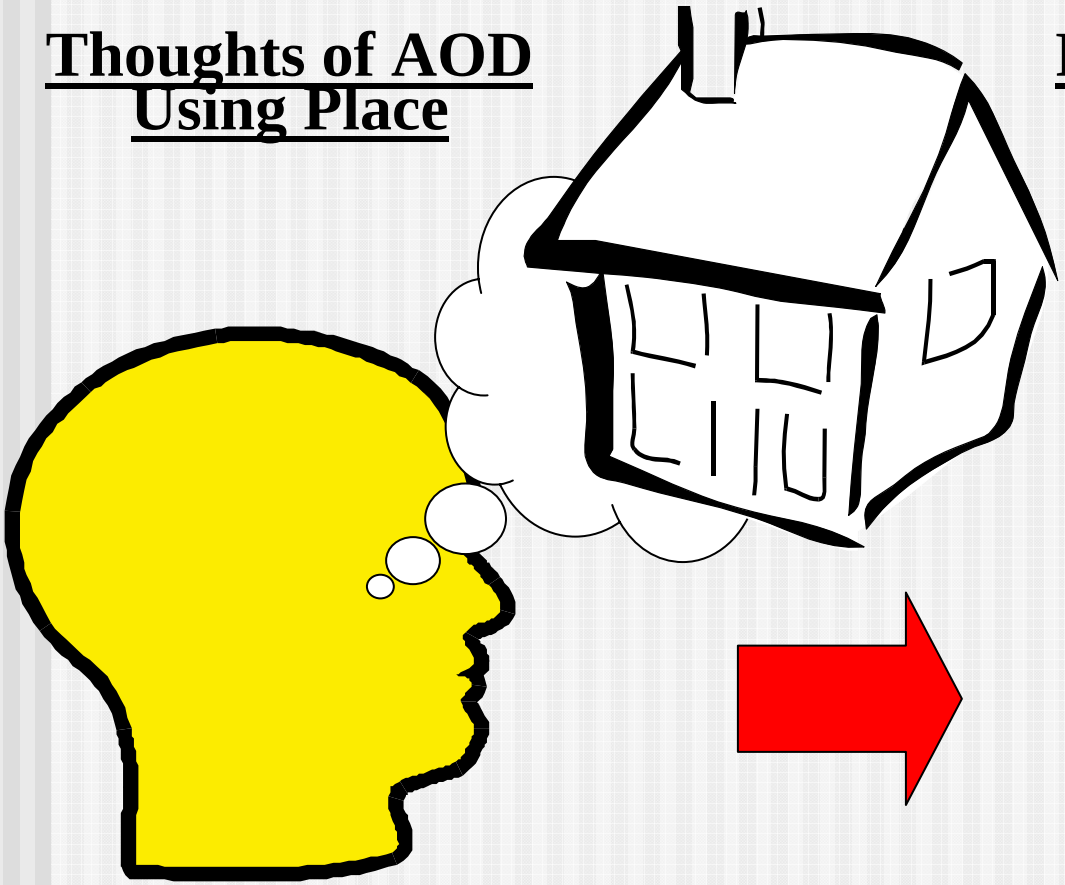
Disaster Phase



Development of Craving Response

Disaster Phase

Thoughts of AOD Using Place



Powerful Physiological Response

- ↑ Heart Rate
- ↑ Breathing Rate
- ↑ Energy
- ↑ Adrenaline Effects

Roadmap for Recovery

Return to Old Behaviors

Anhedonia

Anger

Depression

Emotional Swings

Unclear Thinking

Isolation

Family Problems

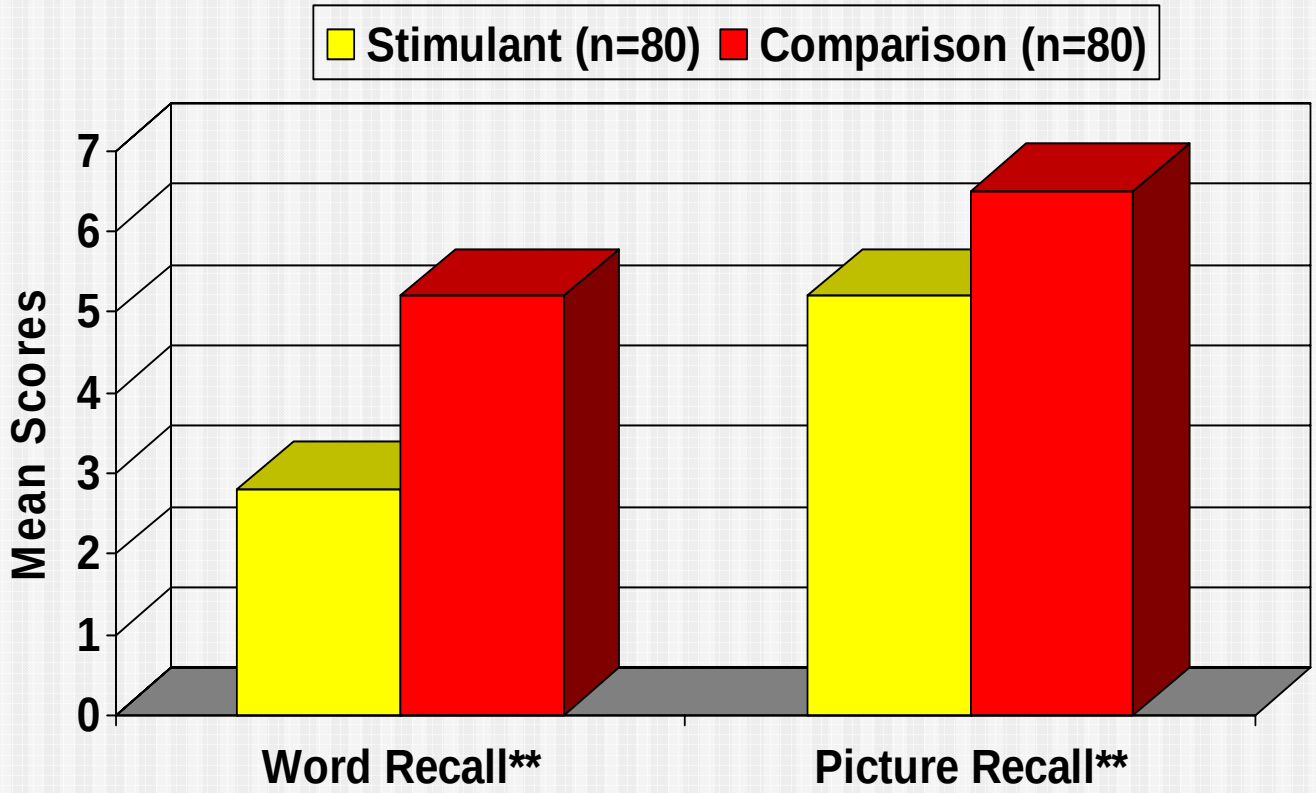
Cravings Return

Irritability

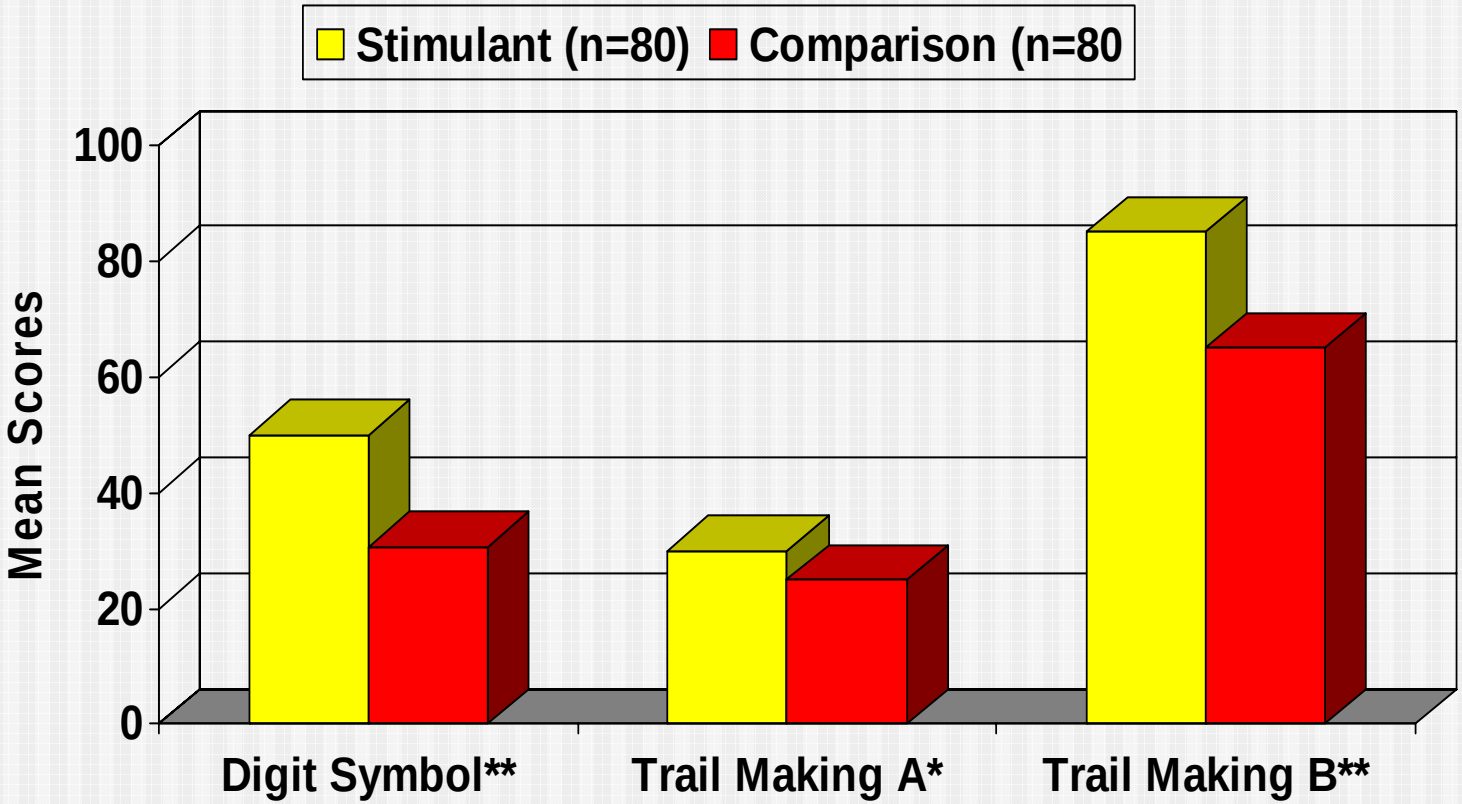
Abstinence Violation

Protracted Abstinence

Memory Difference between Stimulant and Comparison Groups



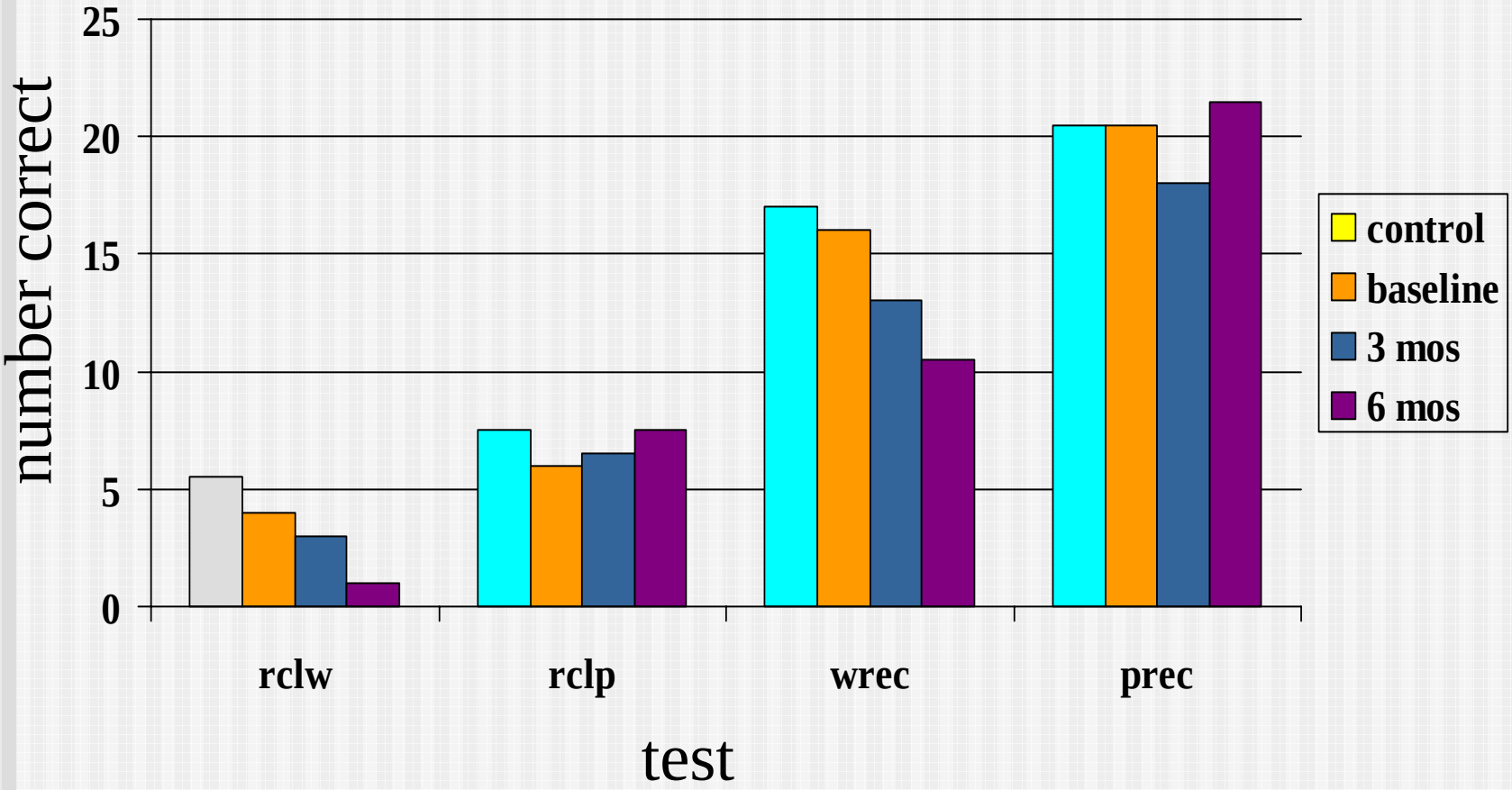
Differences between Stimulant and Comparison Groups on tests requiring perceptual speed



Summary

- Actively using MA addicts demonstrate impairments in:
  - the ability to manipulate information
  - the ability to make inferences
  - the ability to ignore irrelevant information
  - the ability to learn
  - the ability to recall material

Longitudinal Memory Performance



Summary (cont.)

- Some deficits are resolved after a period of 12-weeks of abstinence:
  - The ability to ignore irrelevant information
  - The ability to manipulate information

Summary (cont.)

- Some abilities get worse in the early periods of abstinence:
  - Recall and recognition both show more impairment at 12 weeks of non-use
    than is evident in current users

Methamphetamine
Acute Physical Effects

- **Increases**
  - Heart rate
  - Blood pressure
  - Pupil size
  - time
  - Respiration
  - Sensory acuity
  - Energy

- **Decreases**
  - Appetite
  - Sleep
  - Reaction

Methamphetamine
Acute Psychological Effects

- **Increases**
  - Confidence
  - Alertness
  - Mood
  - Sex drive
  - Energy
  - Talkativeness
- **Decreases**
  - Boredom
  - Loneliness
  - Timidity

Methamphetamine
Chronic Physical Effects

- Tremor
- Weakness
- Dry mouth
- Weight loss
- Cough
- Sinus infection
- Sweating
- Burned lips; sore nose
- Oily skin/complexion
- Headaches
- Diarrhea
- Anorexia

Methamphetamine
Chronic Psychological Effects

- **Confusion**
- **Concentration**
- **Hallucinations**
- **Fatigue**
- **Memory loss**
- **Insomnia**
- **Irritability**
- **Paranoia**
- **Panic reactions**
- **Depression**
- **Anger**
- **Psychosis**

Methamphetamine
Psychiatric Consequences

- Paranoid reactions
- Permanent memory loss
- Depressive reactions
- Hallucinations
- Psychotic reactions
- Panic disorders
- Rapid addiction

Typical Day of MA Use

Amount -- 1 gram

Route -- Smoke

First Use -- "When I wake up"

Other uses -- "Every few hours"

Amount each use -- 1/5 gram

Typical Day of MA Use

Amount -- 3/4 gram

Route -- Shoot

First Use -- "When I get up"

Other uses -- "Noon and Afternoon"

Amount each use -- 1/4 gram

MA Treatment Issues

- Acute MA Overdose
- Acute MA Psychosis
- MA "Withdrawal"
- Initiating MA Abstinence
- MA Relapse Prevention
- Protracted Cognitive Impairment and Symptoms of Paranoia

Acute MA Overdose

- Slowing of Cardiac Conduction
- Ventricular Irritability
- Hypertensive Episode
- Hyperpyrexic Episode
- CNS Seizures and Anoxia

Acute MA Psychosis

- Extreme Paranoid Ideation
- Well Formed Delusions
- Hypersensitivity to Environmental Stimuli
- Stereotyped Behavior “Tweaking”
- Panic, Extreme Fearfulness
- High Potential for Violence

Treatment of MA Psychosis

- Typical ER Protocol for MA Psychosis
  - **Haloperidol - 5mg**
  - **Clonazepam - 1 mg**
  - **Cogentin - 1 mg**
  - **Quiet, Dimly Lit Room**
  - **Restraints**

MA "Withdrawal"

- Depression
- Fatigue
- Anxiety
- Anergia
- Paranoia
- Cognitive Impairment
- Agitation
- Confusion

- Duration: 2 Days - 2 Weeks

Treatment of MA "Withdrawal"

- Hospitalization/Residential Supervision if:
  - **Danger to Self or Others, or, so Cognitively Impaired as to be Incapable of Safely Traveling to and from Clinic.**
  - **Otherwise Intensive Outpatient Treatment**

Treatment of MA "Withdrawal"

- **Intensive Outpatient Treatment**
  - **No Pharmacotherapy Available**
  - **Positive, Reassuring Context**
  - **Directive, Behavioral Intervention**
  - **Educate Regarding Time Course of Symptom Remission**
  - **Recommend Sleep and Nutrition**
  - **Low Stimulation**
  - **Acknowledge Paranoia, Depression**

Initiating MA Abstinence

- Key Clinical Issues
  - **Depression**
  - **Cognitive Impairment**
  - **Continuing Paranoia**
  - **Anhedonia**
  - **Behavioral/Functional Impairment**
  - **Hypersexuality**
  - **Conditioned Cues**
  - **Irritability/Violence**

Initiating MA Abstinence

- Key Elements of Treatment
  - **Structure**
  - **Information in Understandable Form**
  - **Family Support**
  - **Positive Reinforcement**
  - **12-Step Participation**
- No Pharmacologic Agent Currently Available

Treatment of MA Disorders

- Traditional Treatments
  - **Therapeutic Community**
  - **Minnesota Model**
  - **Outpatient Counseling**
  - **Psychotherapy**

Treatment of MA Disorders

- **State of Empirical Evidence**
  - **No Information on TC or "Minnesota Model" Approaches**
  - **No Pharmacotherapy with Demonstrated Efficacy**
  - **Results of Cocaine Treatment Research Extrapolated to MA Treatment**

A Multi-Site Comparison of Psychosocial Approaches for the Treatment of Methamphetamine Dependence

Richard A. Rawson, Ph.D.
and The Methamphetamine Treatment Project Corporate Authors*

Addiction (2004, In Press)

Project Goals:

- **To study the clinical effectiveness of the Matrix Model**
- **To compare the effectiveness of the Matrix model to other locally available outpatient treatments**
- **To establish the cost and cost effectiveness of the Matrix model compared to other outpatient treatments**
- **To explore the replicability of the Matrix model and challenges involved in technology transfer**

Matrix Model

An Integrated, Empirically-based, Manualized Treatment Program

Cognitive Behavioral Therapy

Family and Group Therapy

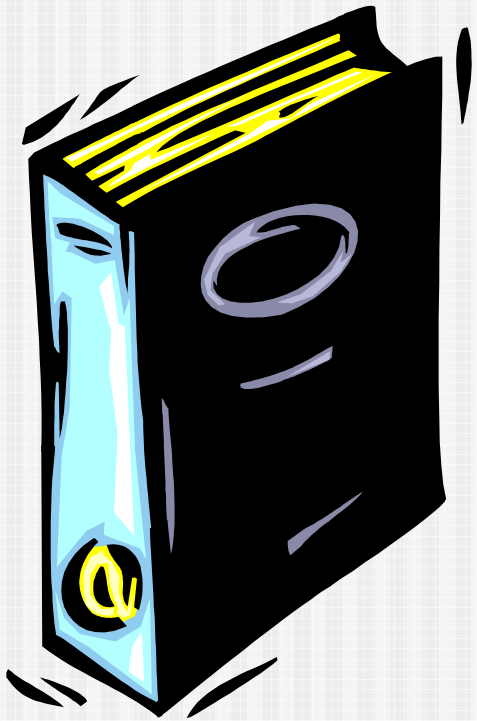
Motivational Interviewing

12- Step Involvement

Psychoeducation

Social Support

Manuals in Psychosocial Treatment



- Reduce therapist differences
- Ensure uniform set of services
- Can more easily be evaluated
- Enhance training capabilities
- Facilitate research to practice

Matrix Model of Outpatient Treatment

Organizing Principles of Matrix Treatment

- Program components based upon scientific literature on promotion of behavior change.
- Program elements and schedule selected based on empirical support in literature and application.
- Program focus is on current behavior change in the present and not underlying “causes” or presumed “psychopathology”.
- Matrix “treatment” is a process of “coaching”, educating, supporting and reinforcing positive behavior change.

Matrix Model of Outpatient Treatment

Organizing Principles of Matrix Treatment

- Non-judgemental, non-confrontational relationship between therapist and patient creates positive bond which promotes program participation.
  - Therapist as a “coach”
- Positive reinforcement used extensively to promote treatment engagement and retention.
  - Verbal praise, group support and encouragement other incentives and reinforcers.

Matrix Model of Outpatient Treatment

Organizing Principles of Matrix Treatment

- Accurate, understandable, scientific information used to educate patient and family members
  - Effects of drugs and alcohol
  - Addiction as a “brain disease”
  - Critical issues in “recovering” from addiction

Matrix Model of Outpatient Treatment

Organizing Principles of Matrix Treatment

- Behavioral strategies used to promote cessation of drug use and behavior change
  - Scheduling time to create “structure”
  - Educating and reinforcing abstinence from all drugs and alcohol
  - Promoting and reinforcing participation in non-drug-related activities

Matrix Model of Outpatient Treatment

Organizing Principles of Matrix Treatment

- Cognitive-Behavioral strategies used to promote cessation of drug use and prevention of relapse.
  - Teaching the avoidance of “high risk” situations
  - Educating about “triggers” and “craving”
  - Training in “thought stopping” technique
  - Teaching about the “abstinence violation effect”
  - Reinforcing application of principles with verbal praise by therapist and peers

Matrix Model of Outpatient Treatment

Organizing Principles of Matrix Treatment

- Involvement of family members to support recovery.
- Encourage participation in self-help meetings
- Urine testing to monitor drug use and reinforce abstinence
- Social support activities to maintain abstinence

Elements of the Matrix Model

- Engagement/Retention
- Structure
- Information
- Relapse Prevention
- Family Involvement
- Self Help Involvement
- Urinalysis/Breath Testing

The Matrix Model

Monday	Wednesday	Friday
Early Recovery Skills **Weeks1-4**	**Family/education** **Weeks 1-12**	**Early Recovery Skills** **Weeks1-4**
Relapse Prevention **Weeks 1-16**	**Social Support** **Weeks 13-16**	**Relapse Prevention** **Weeks 1-16**

- **Urine or breath alcohol tests once per week, weeks 1-16**

Table 1. Sites participating in the MTP (from Herrell et al, 2000)

Coordinating Center	Principal Investigators	Directors
University of California at Los Angeles (UCLA) Integrated Substance Abuse Programs (ISAP)	M. Douglas Anglin, Ph.D. Richard A. Rawson, Ph.D.	Patricia Marinelli-Casey, Ph.D. , Project Director Jeanne Obert, MFT, Clinical Alice Huber, Ph.D. Research Chris Reiber, Ph.D. Statistics
Grantee / Site*	**Principal Investigator**	**Lead Evaluator**
County of San Mateo, Belmont, CA: Two sites: ODASA and Pyramid	Yvonne Frazier, Ph.D. County of San Mateo, Alcohol and Drug Services; Belmont, CA	Joseph Guydish, Ph.D. University of California at San Francisco; San Francisco, CA
East Bay Community Recovery Project, Hayward, CA	Joan Zweben, Ph.D. East Bay Community Recovery Project; Hayward, CA	Judith Cohen, Ph.D., M.P.H. East Bay Community Recovery Project; Hayward, CA
Matrix Center, Costa Mesa, CA	Michael McCann, M.A. Matrix Center; Costa Mesa, CA	Vikas Gulati, B.S. Matrix Center; Costa Mesa, CA
New Leaf Treatment Center, Lafayette, CA	Gantt Galloway, Pharm.D. New Leaf Treatment Center; Lafayette, CA	Janice Stalcup, Ph.D. New Leaf Treatment Center; Lafayette, CA
San Diego Association of Governments, San Diego, CA	Susan Pennell, M.A. San Diego Association of Governments; San Diego, CA	Cynthia Burke, Ph.D. San Diego Association of Governments; San Diego, CA
South Central Regional Mental Health Center, Billings, MT	Denna Vandersloot, B.S. South Central Regional Mental Health Center; Billings, MT	Russell H. Lord, Ph.D. Montana State University; Billings, MT
St. Francis Medical Center, Honolulu, HI	Alice Dickow, B.A. St. Francis Women's Addiction Treatment Center, Hawaii; Honolulu, HI	Ewa Stamper, Ph.D. St. Francis Women's Addiction Treatment Center, Hawaii; Honolulu, HI

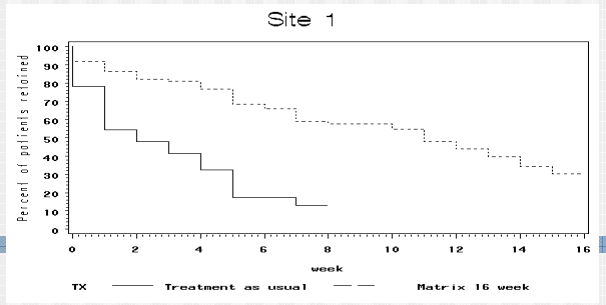
Table 4. MTP Participant Characteristics (taken from baseline ASI)

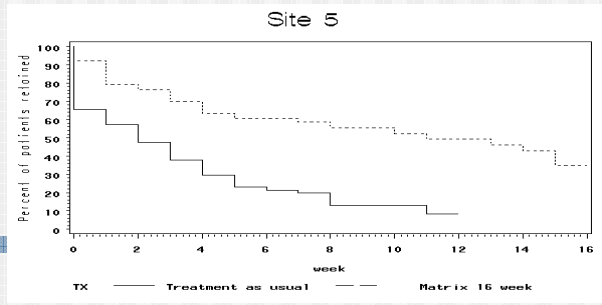
Characteristic	Summary
% Male	45
Age (Yrs.), mean (sd)	32.8 (8.0)
Ethnicity (%)	
Caucasian	60
African-American	2
American Indian	3
Asian/Pacific Islander	17
Hispanic	18
Educational Attainment Level (yrs.), mean (sd)	12.2 (1.7)
% Employed	69
% Married (and not separated)	16
Overall Substance Use Patterns-Lifetime (yrs.), mean (sd)	
Methamphetamine	7.54 (6)
Alcohol	7.6 (8.5)
Cocaine	1.75 (3.5)
Cannabis	7.15 (8)
Overall Substance Use Patterns—Days in Past 30, mean (sd)	
Methamphetamine	11.53 (9.6)
Alcohol	4.72 (7.3)
Cocaine	0.21 (1)
Cannabis	4.38 (8.3)
Preferred Route of Administration of MA (%)	
Oral	0
Nasal	11
Smoked	65
IV- injection	24

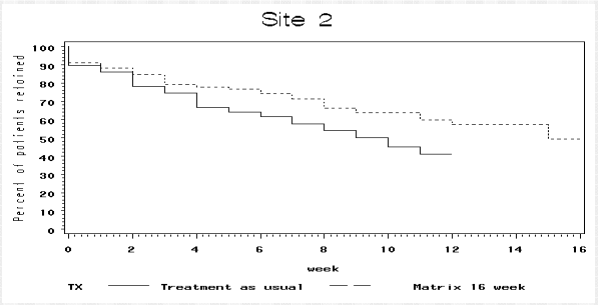
Table 7. Comparison of retention between groups within sites, with Matrix truncated to the length of TAU at each site

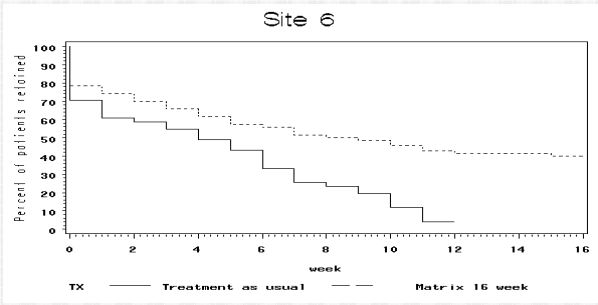
Site	TAU length (wks.)	Log-rank	Chi-square	p
Site 1	8	-20.07	33.17	<0.0001
Site 2	12	-9.49	4.98	0.026
Site 3	12	-8.39	3.68	0.055
Site 4	16	1.64	0.26	0.610
Site 5	12	-22.30	28.74	<0.0001
Site 6	12	-17.46	17.87	<0.0001
Site 7	16	-5.01	3.34	0.067
Site 8	12	-10.59	7.99	0.005

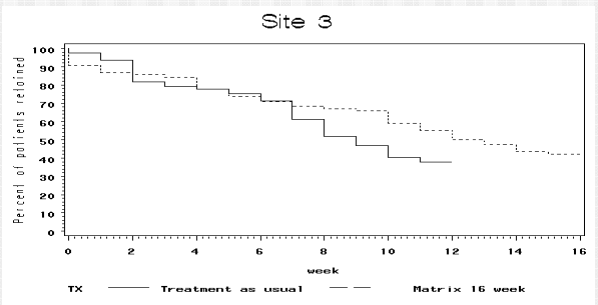
Figure 3. Participant retention throughout treatment, by site and treatment group

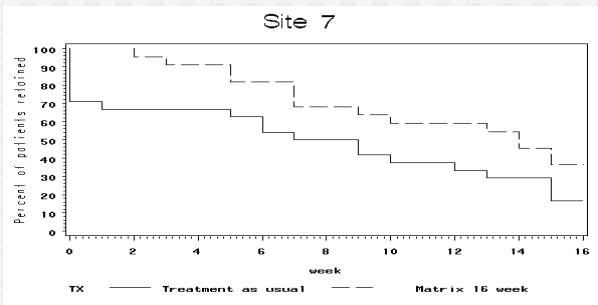


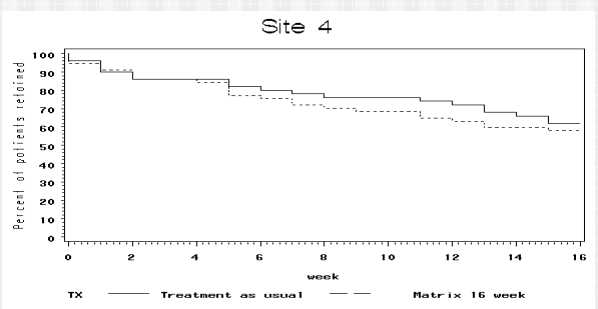












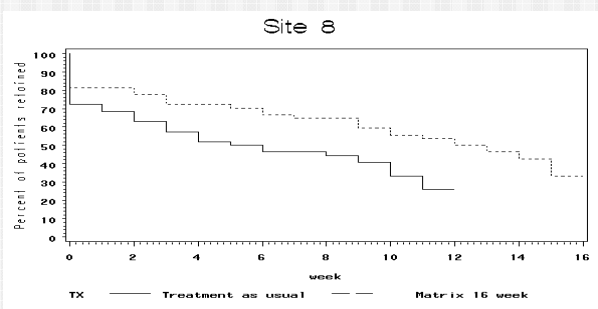


Figure 4. Percent completing treatment, by group

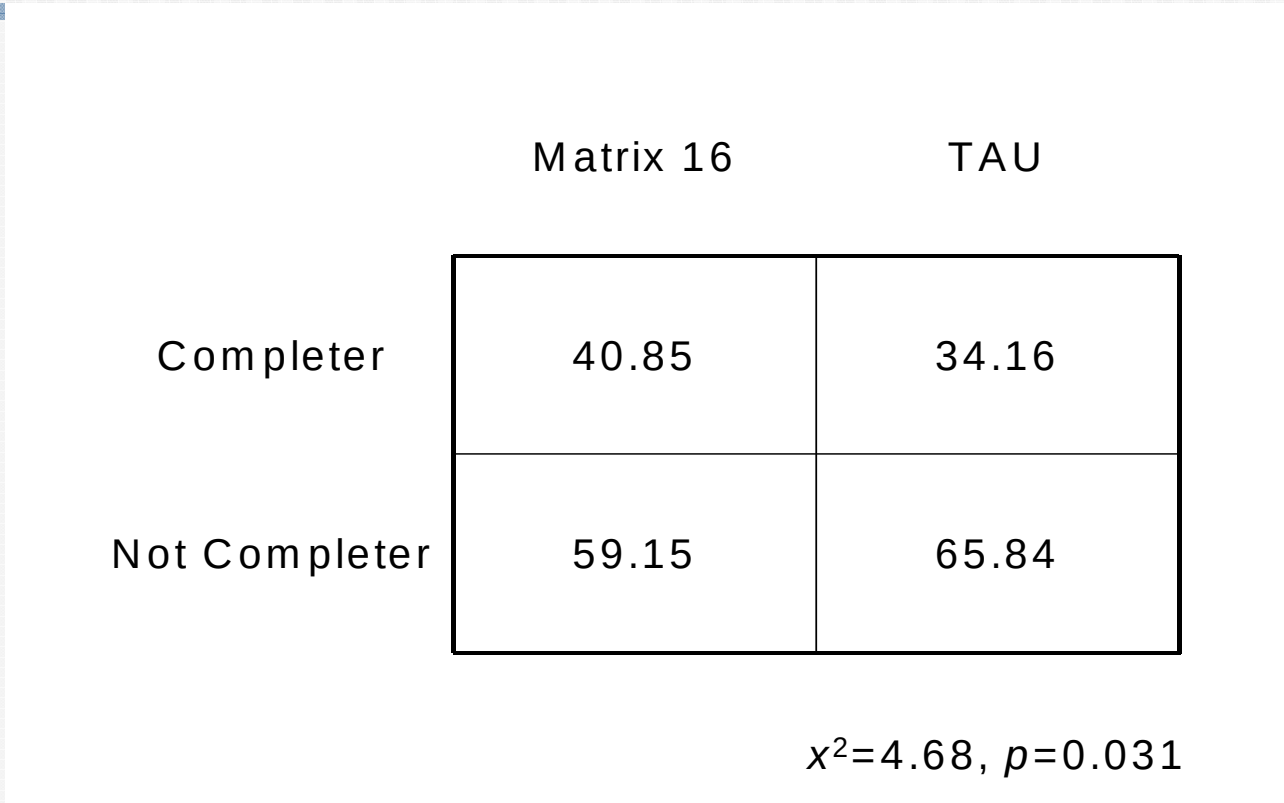


Figure 6. Participant self-report of MA use (number of days during the past 30) at enrollment, discharge, and 6-month follow-up, by treatment condition